THE JOURNAL OF ENGINEERING EDUCATION

Published by the Society for the Promotion of Engineering Education

Published monthly, except July and August, under the supervision of the Publication Committee. A. A. Potter, P. F. Walker, F. L. Bishop, Editor, University of Pittsburgh. Published at Prince and Lemon Sts., Lancaster, Pa.

Entered as second-class matter at the Post Office at Lancaster, Pa., under the Act of August 12, 1912.

New Series Vol. XV, No. 6. FEBRUARY, 1925 Subscription Price, $3.00 per year. Single Copies, 50 cents

TABLE OF CONTENTS.

Protecting the Freedom of Higher Education. President A. A. Potter 409
Report of Chairman of Board of Investigation and Coördination... 411
Annual Report of the Director and Associate Director to the Board of Investigation and Coördination..... 414
An Expression of Opinion as to the Statement of Objectives of the Society's Investigation..... 422
The Engineering Graduate in Industry. A. C. Jewett..... 424
Attendance at Engineering Schools..... 434
Membership of the Society in Different Institutions..... 435
Minutes of the Meeting of the Division of Deans and Administrative Officers, January, 1924. (Conclusion)..... 437
The English Department..... 480
New Members..... 487
Branches 488
College Notes..... i

PROTECTING THE FREEDOM OF HIGHER EDUCATION.

BY A. A. POTTER,

President of the S. P. E. E.

The policy of the Society for the Promotion of Engineering Education has always been to encourage freedom of experimentation on the part of engineering colleges. The Society has at all times discouraged any action which would tend to classify colleges, to dictate internal institutional policies, to standardize engineering education, or to commit an institution to any program. The Society has always felt that its main functions are to interest its members in good teaching and to keep them fully informed of the trend in engineering education.

The investigation of engineering education which is now being conducted by the colleges in coöperation with the S. P. E. E., under a grant by the Carnegie Corporation, is also in line with this policy of the Society to act as a medium in distributing to the colleges facts which should prove of value to them in planning the engineering curricula of the future. In the "Statement of Objectives" which was published in the January issue of the JOURNAL OF ENGINEERING EDUCATION the following remarks are made concerning standardization: "*Furthermore, it appears that the breadth and diversity of engineering activities are such as to make undesirable the standardization of engineering courses or their reduction to a uniform plan.*" This study of engineering education had its inception with the teachers of engineering, and the freely exercised initiative of the colleges is the agency through which the results of this undertaking will be accomplished. The project is a coöperative undertaking to be carried out by the colleges themselves, through a central staff of the S. P. E. E., and with the coöperation of other agencies in the fields of education and industry.

It is most gratifying to note that the policy of the S. P. E.

E. in guarding the autonomy of engineering colleges, in avoiding standardization, and in encouraging experimentation on the part of institutions of higher learning, has had virtual endorsement through resolutions recently adopted by the National Association of State Universities which *"has viewed with increasing concern the rapid increase in the number and variety of organizations which have undertaken to standardize procedures and policies in one or another branch of higher education"* and has appointed a committee which *"shall bring the attitude of this Association to the attention of the organizations and agencies exercising control over educational procedures and policies within the field covered by the state universities."*

It is also gratifying to note that the policy of the Society is in accordance with resolutions recently adopted by the Senate of the University of Illinois in which attention is called to the many outside organizations which pass resolutions expected to affect the policy of higher educational institutions; *"and the rather disquieting circumstances that some of the adopted standards and regulations are occasionally presented in a form which seems to suggest that the University must conform with them if it is to maintain its standing among educational institutions, instead of being submitted to the proper governing bodies as mere suggestions and recommendations looking to general improvement, but dependent entirely for their validity upon the free action of the University functioning as an independent and sovereign body, responsible only to the people of this state and the authorities duly constituted by them for the supervision of its affairs."* The resolutions are intended to clarify this situation and to safeguard the right of the institution to set its own standards independent of the action taken by any outside association, unless the University Senate approves such action.

The S. P. E. E. is in agreement with the principles outlined in the above actions and will be guided by them in stimulating in teachers a desire to develop, broaden, and enrich engineering education.

REPORT OF CHAIRMAN OF BOARD OF INVESTIGATION AND COÖRDINATION.

December 31, 1924.

DR. F. P. KEPPEL, *President,*
Carnegie Corporation,
522 Fifth Avenue,
New York City.

Dear Sir: The grant made by the Carnegie Corporation for the study of engineering education was announced to the Society for the Promotion of Engineering Education in your letter of October 31, 1923. A progress report is now made of the activities to December 31, 1924.

THE BOARD OF INVESTIGATION AND COÖRDINATION.

Responsibility of the direction of the study has been placed by the Society in its Board of Investigation and Coördination. This Board consists of five members appointed by the Council of the Society, its President and Secretary ex-officio, and two members who are not engineering educators.

THE STAFF.

The Board appointed Mr. W. E. Wickenden as Director. He began his duties on a part-time basis on November 15, 1923, and entered into full-time activities on January 1, 1924. Professor Harry P. Hammond, of the Polytechnic Institute of Brooklyn, on leave of absence, is Associate Director. The headquarters are in the Engineering Societies Building in New York City.

REPORT OF ACTIVITIES.

The annual report to the Board by the Director and Associate Director contains in summary form our various activities. The first year's work has been largely of reconaissance and of making the various contacts for carrying out the general plan by which the colleges themselves and various other agencies such as engineering societies will actively

participate in the project. Over fifty engineering colleges have been visited as well as six sectional meetings of the Society, the annual conference of the Division of Deans and Administrative Officers, and the annual convention. Conferences have been held with many educators, engineers, and industrialists as to the fundamental aspects of the problem. Four general committees of the Society and local committees in one hundred and one institutions are coöperating. All this has provided a solid foundation upon which to proceed with the active steps of the undertaking. It indicates that revolutionary changes are not called for but that immediate adjustments in the practices of the colleges and their external relations may be essential for keeping pace with the unceasing advances in engineering education in industries and in scientific knowledge. These and other matters are elaborated in the report of the Director and Associate Director which is appended hereto.

Objectives and Procedure.

Based upon this reconaissance the Board has adopted a formal statement of objectives and procedure at its meeting of December 5, 1924. This statement accompanies this report. The fundamental purpose is to determine the objectives of engineering education and the most suitable curricula.

European Studies.

The Director sailed in December to take up the study of engineering education in European countries. He goes with numerous letters of introduction from individuals, from engineering societies, from the United States Bureau of Education, and from the State Department in Washington.

Meetings of the Board.

Eleven meetings of the Board have been held, six since the grant by the Carnegie Corporation.

PUBLICATIONS.

The publication of the Society, THE JOURNAL OF ENGINEERING EDUCATION, presents the progress of the study to the engineering teachers and college authorities each month. The report of the Director and Associate Director contains a list of articles contributed by them to the JOURNAL and to other periodicals.

NATIONAL INDUSTRIAL CONFERENCE BOARD.

A comprehensive study and investigation of college graduates in industry and various relations of engineering education to industry is being made by the National Industrial Conference Board (at its own expense). The Joint Advisory Committee on Engineering Education, composed of a number of eminent industrialists and representatives from the Society for the Promotion of Engineering Education, is giving counsel in the pursuit of these investigations. The results are being published at present as summaries of the investigation of specific industries to be followed by a comprehensive report. It is anticipated that the work will be stimulating to the industries and will afford immediate suggestion and aid to the engineering schools.

APPRECIATION.

The Society for the Promotion of Engineering Education, through its Board of Investigation and Coördination, desires to express its appreciation of the action of the Carnegie Corporation in making this unconditional grant as an aid in the development of engineering education.

Very truly yours,

CHAS. F. SCOTT,
Chairman, Board of
Investigation and Coördination.

ANNUAL REPORT OF THE DIRECTOR AND ASSOCIATE DIRECTOR TO THE BOARD OF INVESTIGATION AND COORDINATION OF THE SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. DECEMBER 31, 1924.

Organization.—Preliminary work on the project began late in 1923 and active operations were marked by the establishment of headquarters in the Engineering Societies Building on January 1, 1924. During the year financial and office routines have been systematized, forms standardized, record and indexing systems established, mailing lists for publicity selected and other details of work at the headquarters office placed upon a systematic basis. The staff has been increased to five persons, including the Director, the Associate Director, a research assistant, a chief clerk and a stenographer. It is expected that a staff of these proportions will be maintained throughout 1925, with a possible increase in 1926.

Reconnaissance.—At the beginning of active work, it was apparent that the objectives of the project had been formulated only in the most general terms and that it was necessary before adopting a definite program for the undertaking to determine the fundamental issues confronting engineering education. It was also necessary, since the project had been conceived as an essentially coöperative undertaking, to appraise the instrumentalities through which it would be conducted. This called for the widest practicable contact with the colleges and other prospective coöperative agencies and with individuals whose views on the matter would probably be of value. For these purposes visits were made to forty-eight of the engineering colleges in the United States and three in Canada. In the great majority of such visits there were extended conferences with administrative officers, a conference with the engineering faculty as a whole, and a conference with the special committee of investigation. Six

sectional meetings of the Society, the annual conference of deans and administrative officers, and the annual convention at Boulder, Colorado, were attended and addressed. At each of these meetings there were extensive discussions of the project. Conferences have been held with a considerable number of educators, engineers, and industrialists as to fundamental aspects of the problem.

Equal importance has been attached to the establishment of contacts with the professional organizations of engineers. Dinner conferences were held at the annual meetings of the four principal societies. These were largely attended. Conferences were held with the local organization of engineers at Philadelphia, Pa., St. Louis, and Toronto. Contact has also been established with forty-five other national engineering societies and the Engineering Institute of Canada.

It has also been apparent in the formulation of a program that careful study should be given to studies and investigations which have been made in recent years in other educational fields, in order to profit by the experiences and results of these investigations. Considerable attention has therefor been given to a thorough analysis of the methods and results of the investigations of education in medicine, law, theology and dentistry.

This extended reconaissance has served to provide a solid foundation upon which to proceed with the active steps of the undertaking. It has brought to light no striking abuses or organic defects in engineering education which would seem to call for revolutionary changes. It has indicated, however, that important adjustments in the practices of the colleges and in their external relations may be called for to meet the extraordinary changes which are taking place in the realm of elementary and secondary education; in industry, professional life, and public affairs; and to keep pace with the unceasing advance of scientific knowledge.

The results of this reconaissance have been laid before the Board and have been embodied in the official statement of

objectives and procedures which was adopted by the Board on December 5, 1924.

Coöperative Agencies.—From the earliest stages of its inception the project has been conceived as a coöperative undertaking to be carried out by the colleges themselves through a central staff and with the coöperation of other agencies in the fields of education and industry. In accordance with this conception, much attention has been devoted during the reconaissance and developmental stages to securing the coöperation of all concerned with engineering education and to organizing the particular agencies through which the work of the project is now being conducted. The principal of these coöperative agencies now engaged in the work are as follows:

(1) The Society for the Promotion of Engineering Education in its collective capacity through four special committees of investigation concerned respectively with studies relating to (*a*) engineering students and graduates, (*b*) the problems of admission and elimination, (*c*) teaching personnel, and (*d*) the services rendered by the engineering colleges and their resources. These committees are acting in an advisory and supervisory capacity in relation to studies which are being carried on by committees of the faculties.

(2) Special committees or other agencies of investigation of the faculties of 101 engineering colleges. The majority of these committees are carrying out a series of definitely formulated projects.

(3) A joint conference group consisting of the educational counselors appointed by the national engineering societies, the executive secretaries of those societies, the Board of Investigation and Coördination, the Director, and the Associate Director. This group is sponsoring a series of studies concerning the relations of the professional organizations of engineers with the engineering colleges.

(4) The United States Bureau of Education, which is

carrying out a comprehensive statistical study of engineering curricula and of facts relating to enrollment and degrees granted in engineering colleges.

(5) Twenty-two national engineering societies, which are dealing with problems of the extent and type of training needed to equip men for their respective fields.

(6) One of the honorary engineering fraternities, which is collecting information from its graduate members.

(7) The Carnegie Foundation for the Advancement of Teaching and the American Council on Education, which have made available statistical information which is of great value.

Close coöperation is also being maintained with the extensive survey of the relationship of engineering education to the industries which is being carried out under the Joint Advisory Committee of the National Industrial Conference Board in which this Society is represented.

Similar coördination is being maintained with the inquiries which are being conducted by the American Railway Association in the field of railway transportation.

Studies in Progress.—During the year 1924 active work was begun upon an extensive program of studies designed to bring out the facts in relation to the present status of engineering education and the evolutionary processes through which it has been brought to its present position. For purposes of indexing and record-keeping these studies have been grouped into the following five major divisions:

A. Studies relating to the present practices and past experiences of the engineering colleges.
B. Studies relating to the occupational demand for engineering graduates.
C. Studies of the relationship with professional organizations of engineers.
D. Studies and projects in educational psychology.
E. Studies of engineering education in Europe.

Studies in the first division have been undertaken by the special investigative committees of the Society, the coöperative committees of the faculties, the United States Bureau of Education, and by members of headquarters staff. A group of these studies was prepared in standardized form during the summer of 1924 and forwarded to committees in a majority of the coöperating institutions about October 1st. These studies relate to entering students. They are now being carried out actively and a considerable amount of data resulting from them has been received at the headquarters office. Two other studies of this group, namely, those relating to teaching personnel and to the services rendered by the engineering colleges and their facilities, have until recently been under consideration by committees of the Society. These will be sent to faculty committees shortly after January 1.

Studies in this same general division of the undertaking which are being conducted by the United States Bureau of Education, as previously mentioned herein, are well advanced and are being pushed rapidly to completion.

Studies of the historical evolution of engineering curricula and of the educational requirements and standards of other groups of professional schools have been undertaken by members of the staff and are now practically complete. Some have been put in final form for publication.

Studies in the second division comprise those which are being conducted as a coördinate undertaking by the National Industrial Conference Board. These studies have reached a well-advanced stage.

In this same general division a study of the demand for engineering graduates in the field of railway transportation and the relationship of engineering education to the transportation industry is being undertaken by a committee of the American Railway Engineering Association. A similar study is under consideration by the National Electric Light Association.

Studies in the third division are being undertaken by the staff under the sponsorship of the joint advisory group consisting of the educational counselors, secretaries of the four principal engineering societies and the Board. Inquiries into the definition and characteristics of professional status, into the distinctive characteristics of engineering as a profession in relation to engineering education, and into the relationship between professional schools and professional organizations in medicine, law, dentistry and architecture have been carried forward actively and are now either completed or nearly completed.

In the fourth division, a review of present-day opinion as to the philosophy of educational objectives is well advanced.

Two projects have also been undertaken under the general guidance of Dr. Seashore of the Board. One of these relates to placement examinations and the sectioning of classes on the basis of ability. During the summer of 1924, a set of placement examinations in mathematics, English, French and chemistry was prepared under the direction of Dr. Seashore by Dr. Ruch and Mr. Stoddard of his staff. These examinations were sent to all of the engineering colleges with invitations to give the examinations to this year's entering class. As a result, the examinations have been given to approximately 1,500 students in 13 different institutions. Score in the examinations have been sent to headquarters office. First semester grades in corresponding subjects of the freshman year will also be obtained.

A second study, consisting of the diagnosis of cases of impending failure, determination of the principal causes of failures and remediable measures to be taken in such cases, was outlined by Dr. Seashore. Invitations to carry out the work were sent to a small group of institutions. This work has now been undertaken in five colleges. The results of the project will be available at the end of the present academic year.

The fifth division of the studies comprises extensive comparative analyses of engineering education in this country and in Europe. This work is being taken up by the Director who will spend the first half of the year 1925 abroad. These studies will comprise inquiries into the plan of organization of higher engineering education in relation to intermediate and secondary education and to other forms of higher education; the organization and conduct of engineering schools; the relationship of engineering schools to professional organizations of engineers; the relationship of engineering schools to industry and the relationship of engineering schools to public administration.

By the Director:

Report of a Dinner Conference on Engineering Education at the Annual Meeting of the American Society of Mechanical Engineers. ENGINEERING EDUCATION, January, 1924.

The Program of the Board of Investigation and Coördination. ENGINEERING EDUCATION, February, 1924.

Live Issues in Engineering Education. *Technology Review*, May, 1924.

Notes from the Field. ENGINEERING EDUCATION, May, 1924.

Conference on the Relations of the Engineering Schools to the National Engineering Societies. ENGINEERING EDUCATION, June, 1924.

Education for the Profession of Engineering. A paper presented at the First International Management Conference, Prague, Czechoslovakia, July, 1924.

Investigation and Development in Engineering Education. *Journal of Personnel Research*, July, 1924.

A Report of Progress and of Plans for Future Action. JOURNAL OF ENGINEERING EDUCATION, September, 1924.

College Education and Professional Training. JOURNAL OF ENGINEERING EDUCATION, November, 1924.

BOARD OF INVESTIGATION AND COÖRDINATION.

Professional Organizations and Professional Schools. JOURNAL OF ENGINEERING EDUCATION, December, 1924.

By the Associate Director:

Progress in the Society's Investigation of Engineering Education. JOURNAL OF ENGINEERING EDUCATION, November, 1924.

Eta Kappa Nu and the Investigation of Engineering Education. *The Bridge,* December, 1924.

Respectfully submitted,

(Signed) W. E. WICKENDEN, *Director,*
H. P. HAMMOND, *Associate Director.*

AN EXPRESSION OF OPINION AS TO THE STATEMENT OF OBJECTIVES OF THE SOCIETY'S INVESTIGATION.

The following letter has been received at the Director's office from Professor Donald Derickson, Chairman of the Cooperative Faculty Committee of The Tulane University of Louisiana.

It is published in this number of the JOURNAL with the purpose of eliciting further opinions from coöperative committees throughout the country. It is only through expressed opinions of the teachers of engineering that the course of the investigation can be so shaped as to follow properly its avowedly coöperative principle.

MR. H. P. HAMMOND, ASSOCIATE DIRECTOR,
33 West 39th Street,
New York City.

Dear Sir: The copies of the pamphlet (A Statement of Objectives and Outline of Procedure of the Investigation of Engineering Education) were distributed to the numbers of the coöperating committee. Some of the comments which have been received are as follows:

From Professor Gregory—

"I have read 'A Statement of Objectives and Outline of Procedure of the Investigation of Engineering Education' with much interest. It is a very ambitious plan which, if carried to completion, will answer a great many questions that have perplexed engineering instructors.

"If the objectives can be realized so that actual facts will be available the work ought to be of monumental importance. It is undoubtedly true that some of the information sought is along lines of personal opinion and personal experience, while another portion is capable of exact measurement and statement. All this will require a great deal of hard work for somebody; let us hope that the final product will be worth the effort."

From Professor Eliott—

"My only comment is an obvious one—an open endorsement of the objectives and procedures."

From Dean Anderson—

"It all seems to me very important, carefully thought out and well arranged. In my opinion the most interesting of the objectives of investigation is Number One, which has for its intent the clarification of the educational functions and responsibilities of the colleges of engineering.

"Under the mass of suggestions and criticisms which come to the engineering colleges, both from without and within at the present day, it is an exceedingly difficult problem to give an adequate answer to the question of the education function and responsibility of the college. If this investigation succeeds in collecting evidences upon which an adequate answer to these questions can be based, it will have accomplished a work of incalculable value to the cause of engineering education."

My own opinion is that this investigation will give us an opportunity to "see ourselves as others see us." Whatever the results of the investigation may be, they are bound to be far reaching in their effect upon the future of engineering education.

Yours very truly,

(Signed) DONALD DERICKSON,
Chairman, Coöperative Faculty Committee,
Tulane University.

THE ENGINEERING GRADUATE IN INDUSTRY.

BY A. C. JEWETT,

Research Staff, National Industrial Conference Board.

The National Industrial Conference Board is conducting a series of studies to determine what use is made of technical graduates at the present time by a number of the more important basic industries and what is needed better to adjust education to the needs of industry. Up to this time studies have been completed in four industries, namely, paper and pulp, rubber, textiles, and the metal trades, and brief summary reports have been published pertaining to the first three. The report upon the results of the study of the metal trades is in preparation and will be published shortly. Studies are in process dealing with the chemical industry and with coal mining and it is probable that one or two others will be added before the series is completed.

The preliminary reports give only the outstanding results of the survey. When the entire series of studies is completed the results will be analyzed, compared and published by the Conference Board in a composite report on "Technical Education and American Industry." In that report specific points will be discussed at length with separate chapters on each of the industries studied.

These studies are, in a way, a continuation and more concrete development of the work in this field previously undertaken by the Conference Board and initially covered in its Special Report No. 25. "Engineering Education and American Industry." The material of that report was the subject of a paper entitled "The Engineer as a Leader in Industry," presented by Oliver S. Lyford, at the Ithaca meeting of the Society for the Promotion of Engineering Education, held in June, 1923. The work covered by that report, as well as these more recent studies was carried on with the guidance

and advice of a committee of sixteen eminent industrialists and educators called the Advisory Joint Conference Committee on Engineering Education. This committee was appointed jointly by the Society for the Promotion of Engineering Education and the National Industrial Conference Board as explained in the foreword to the paper as published in the Society's Proceedings.* In addition to this main committee each additional study has had the benefit of the advise and assistance of a sub-committee of leading men of each industry considered. These committees also reviewed the results of the study before publication. It has been very gratifying to find that this subject commands the interest to a very large extent, not only of educators, but of our most eminent industrial leaders.

The purposes of this survey were to discover to what extent industry uses technically trained men, what positions they hold, how the industry absorbs them and what further training it provides for them, and to determine the kind of technical training at colleges which will better qualify their graduates for executive and administrative, as well as technical, positions in the industry. From this information it is intended to draw deductions regarding what is necessary to ensure a closer and more responsive relationship between technical education and industry.

In what follows the term "technical education" refers to all such engineering and scientific education as is usually given in institutions of recognized college grade. In like manner, "technical men" and "technical graduates" refer to those who have had technical training of college grade. Because many men in industry are graduates of other than technical college courses, these have been considered and referred to as "non-technical college men." The term "college," when used alone, includes all colleges, whether technical or not.

* See *Proceedings of the Society for the Promotion of Engineering Education*, Ithaca Meeting, 1923, Vol. XXXI, p. 136.

The Number of College Men in Four Industries.

Table I gives the number of college men in each industry as determined from the reports received from all of the companies coöperating. These figures cover a total of 787 plants and over 388,000 employees.

TABLE I.

Number of College Men in Industry.

	Industry.				Totals and Averages.
	Paper and Pulp.	Rubber.	Textiles.	Metal Trades.	
(1) Total employees in industry *	115,430	124,738	738,089	777,310	1,755,567
(2) Employees in establishments coöperating in this survey.	36,113	100,100	145,500	106,525	388,238
(2a) Per cent. of total.....	34.2%	80.3%	19.7%	13.7%	22.2%
(3) Employees in technical and supervisory positions of item (2).....	2,662	7,023	8,851	16,002	34,538
(3a) Per cent. of item (1).....	7.4%	7.0%	6.1%	15.0%	8.8%
(4) College men with technical training—item (2).....	482	966	861	1,965	4,274
(4a) Per cent. of item (3).....	16.5%	13.8%	9.7%	12.3%	12.3%
(5) College men, total.....	586	1,637	†1,210	2,742	6,175
(6) Per cent. of item (3).....	22.0%	23.3%	13.7%	17.1%	18.9%

Table II shows the distribution of men according to principal training and Table III gives an approximate analysis of the reasons given for entering the industry where now employed.

These tables present in concise form a part of the primary statistical data provided by the companies which coöperated in the studies.‡ The most important points brought out by these tables are as follows:

1. More than 8 per cent. of the men in these industries to-

* From U. S. Census of Occupations, 1921.

† Number with non-technical training estimated.

‡ More complete data are available in the reports upon Technical Education above referred to and which may be obtained, at a nominal price, from the National Industrial Conference Board, 247 Park Avenue, New York.

TABLE II.

PERCENTAGE DISTRIBUTION ACCORDING TO PRINCIPAL TRAINING OF ALL MEN REPORTED.

Major Subject.	Industry.							
	Paper and Pulp.		Rubber.		Textiles.		Metal Trades.	
	Number of Men Reported.	Per Cent. of Total College Men.	Number of Men Reported.	Per Cent. of Total College Men.	Number of Men Reported.	Per Cent. of Total College Men.	Number of Men Reported.	Per Cent. of Total College Men.
Chemistry	187	31.9	367	22.4	} 236	19.5	131	4.8
Chemical Engineering	68	11.6	117	7.1				
Mechanical Engineering	131	22.4	281	17.2	124	10.2	1376	50.2
Electrical Engineering	34	5.8	73	4.5	20	1.7	241	8.8
Civil Engineering	31	5.3	52	3.2	19	1.6	94	3.4
Textile Engineering	—	—	—	—	437	36.1	—	—
Mining, Metallurgy or Geology	9	1.5	—	—	—	—	41	1.5
Forestry	22	3.8	—	—	—	—	—	—
Other Engineering	—	—	76	4.6	25	2.1	82	3.0
Non-engineering	104	17.8	671	41.0	349*	28.8	777	28.3

* Estimated.

day hold executive or other positions of importance, and of these one-fifth (18.9%) are college graduates.

TABLE III.

REASONS FOR ENTERING THE INDUSTRY.*

	Industry.			
	Paper and Pulp.	Rubber.	Textiles.	Metal Trades.
Number of men reporting....	202	326	219	634
Reason.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Ownership	12.3	3.0	13.2	6.3
Fathers' Trade	4.9	0.6	6.3	2.1
Relatives or Friends	4.9	13.8	8.2	11.7
The local industry	5.9	2.2	4.6	2.5
Home Connection	28.0	19.6	32.3	22.6
Previous business connection	8.9	2.2	5.5	4.7
Summer employment	4.9	1.6	0.9	1.4
Services Solicited	5.4	6.1	6.4	7.3
Business Experience	19.2	9.9	12.8	13.4
Definite personal choice	25.1	52.1	32.9	39.2
Advice of school	2.0	7.1	6.4	2.8
Answered Advertisement	1.5	0.9	0.5	2.5
Conscious Selection	28.6	60.1	39.8	44.5
No Definite Influence	24.2	10.4	15.1	19.5

2. The largest number of college men in the paper and pulp and the rubber industries had their principal training in chemistry or chemical engineering with mechanical engineering next in order. In the textile industry the predominating college training was textile engineering with non-engineering subjects and chemistry next in order. In the metal trades the principle training was in mechanical engineering with a very large number who had their principal training in non-engineering subjects. Non-engineering subjects represent very largely academic courses, but includes also those who were trained in law, medicine, business administration, etc.

3. The largest number of graduates of technical colleges in the paper and pulp, rubber and metal trade industries was found in the engineering and drafting departments and in laboratories. In the textile industry the largest number of technical graduates was found in the manufacturing departments as department heads or overseers. It should be noted, however, that although the number of college graduates occupying the more important executive and official positions was smaller, the percentage of men with college education in such positions was much higher than in positions of less importance.

ADAPTATION OF COLLEGE MEN TO INDUSTRIAL REQUIREMENTS.

After these initial data were gathered, questionnaires were sent to all of the college men reported by the companies. Approximately 25 per cent. of these men returned the questionnaires, from which analyses were made which bring out the following points:

1. These industries as a whole offer very little in the way of further systematic training for the college men which they absorb. Over a thousand men reported that they had done some kind of studying since entering industry, but of these, over 89 per cent., have proceeded with their studying *on an entirely independent basis.* The largest number of men depended upon the reading of trade journals and technical books to keep themselves abreast of developments in their lines; others followed correspondence courses or other systematic study of business administration, accounting, or the special technology of their industry.

2. A large proportion of college men reporting feel the lack of experience or of some specific knowledge or ability is the greatest impediment to their advancement. Individual personal limitations and industrial conditions, such as slack business, or unprogressive company policies are other difficulties frequently mentioned.

3. Summer employment for college students is considered

highly desirable and valuable by the majority of college men reporting.

4. As a general rule the college men who followed after graduation the lines of their college training are satisfied with their technical and engineering courses, though some have definitely indicated the lack of one or more particular courses which they believe would have been helpful in their industry, and all have done further studying.

5. The subjects mentioned by the largest number of men in which more collegiate training is considered desirable are: business administration, accounting, economics, psychology, English, public speaking and finance.

6. College graduates who answered the questionnaire were asked to state how they happened to enter the industry in which they are employed. The replies have been analyzed and set forth in Table III. Naturally this is a subject which is not susceptible to exact analysis and classification. There is inevitably a certain amount of overlapping. However, the tabulation of the reasons given may be interesting.

It is essential to know what management thinks regarding the college men it uses. Therefore, representative executives in each industry were requested to express an opinion on certain specific questions. Answers were received from men in important executive positions in 220 companies. The analysis of this material brings out the following points.

1. The majority of the companies reporting use college men with technical training, which indicates that there is a very definite place for such men in their industry. The textile industry seems to be an exception as in its case the majority of the companies do not make extensive use of engineering graduates.

2. Only a small number of companies state that they use college men during summer vacation periods, and even fewer indicate any experience at all in affording summer employment for college instructors.

3. Only thirty-one of the 220 companies report that they participate in any system of coöperative education whereby

students are used in alternate periods of practical work and college study.

4. But nine of the companies reporting have established fellowships at technical colleges.

5. Fifty-one companies refer research work to college laboratories.

6. The companies reporting seem to have no standard practice for recruiting the services of technically trained men. In some cases, application is made direct to the colleges, but in the larger number of cases it is left to chance acquaintances or application on the part of the men.

7. Thirty-five companies state that they send representatives to the colleges to give lectures on various aspects of industry.

8. Only thirty-one companies report having any form of systematic training for college men after their employment.

9. Sixty-two companies reply that they have had good results in using technically trained men in positions which previously were filled by men without technical training.

10. A considerable number of companies report good experience in using college men with other than technical training in positions of a more or less technical nature.

11. Of the companies replying as to the importance of personality to the success of a college man in industry, the great majority feel that it is of primary importance. Some consider this of minor importance in strictly technical positions.

Suggestions by College Graduates.

Constructive criticisms were solicited from the college men and the executives who coöperated in the study. The college men emphasized the following points:

1. College men should, in addition to cultural and technical training, have some training in general business subjects.

2. More technical men should be used on production methods, ways of reducing waste, standardization, and research.

3. Provide for the college men employed an opportunity to

secure a perspective of the entire industry so that they may better correlate their specific activities with a knowledge of the entire process.

4. There is need of a definite and fair promotion plan based on merit and accomplishment.

5. There is need for closer coöperation between technical colleges and industry to the end that the student may be better fitted for his future work.

6. It is advisable for young men to work during summer vacations in industry so that they may choose more intelligently the particular branch of the industry in which they wish to specialize.

Suggestions by Management.

The management group offer the following constructive suggestions:

1. Bring the colleges and industries closer together so that each may have a clearer and more comprehensive understanding of the problems of the other.

2. Train college men in the fundamentals and train them in thinking, leaving the highly specialized knowledge to be attained after the men have entered the industry. This makes for greater flexibility in the ultimate use of college men.

3. The colleges might well send out their instructors during summer vacation periods to work in industrial plants, thus affording an opportunity for those who teach to keep closely in touch with the current practice of industry. Visits and conferences between plant executives and college department heads were also suggested by several.

4. Encourage summer employment in industry for college students.

Conclusions.

Other general conclusions deduced from the above material are:

1. There are many possible contacts between industry and the colleges of the country which should be developed.

2. Better results will be accomplished in the use of tech-

nically trained men in industry if there is a closer relationship established between the colleges and the industries.

3. Summer employment of college men and college instructors, lectures at colleges on the industry by company representatives and the use of coöperative school students, are some of the methods by which a closer relationship may be established.

4. The best technical training for the paper and pulp and the rubber industries is chemical engineering: for the textile industry, the recognized textile school courses: and for the metal trades, mechanical and general engineering. The broad, fundamental theory should be taught, and specific engineering courses should be supplemented with adequate training in English and psychology, economics and business administration subjects.

The main points which should receive the attention of both those in the commanding positions in industry and in the educational field appear to be:

1. What can industry do
   - (*a*) to fit college graduates to its needs;
   - (*b*) to afford vocational guidance to graduates so that those best adapted for an industry may select it.
   - (*c*) to take up the slack now existing so as to shorten the time in which a college graduate may become fitted for responsible positions?
2. What can colleges do
   - (*a*) to develop the personality of their graduates;
   - (*b*) to give their graduates such a command of the English language as to enable them to express their ideas clearly and convincingly.
   - (*c*) to enable graduates to choose more wisely vocations which are adaptable to their personality and training?

These problems should be attacked by industry and the colleges in coöperation to obtain results which will bring greater efficiency to the industry and greater satisfaction to the technical colleges.

ATTENDANCE AT ENGINEERING SCHOOLS.

COMPILED BY W. C. JOHN,

United States Bureau of Education.

COMPARATIVE ENROLLMENTS IN ENGINEERING SCHOOLS FROM 1921–22 TO 1924–25 INCLUSIVE.

Based on Enrollments for the First Semesters of these College Years.

Curriculum.	Years.	Freshman and Sophomore Combined.	Junior Year.	Senior Year.	Total Regular 4-Yr. Students.
Total enrollments in 121 schools of Engineering including all curricula and courses of study	1921–22	35,739	11,870	9,157	56,766
	1922–23	31,470	10,823	9,995	52,288
	1923–24	32,129	11,108	9,189	52,426
	1924–25	33,721	10,523	8,589	52,833
Civil Engineering	1921–22	8,065	2,695	2,078	12,838
	1922–23	6,761	2,433	2,018	11,212
	1923–24	6,819	2,555	1,907	11,281
	1924–25	8,738	2,681	2,271	13,690
Mechanical Engineering	1921–22	9,105	3,005	2,343	14,453
	1922–23	7,774	2,637	2,481	12,892
	1923–24	6,675	2,480	2,229	11,384
	1924–25	6,072	2,181	1,831	10,084
Electrical Engineering	1921–22	8,363	2,961	1,951	13,275
	1922–23	7,613	2,658	2,360	12,631
	1923–24	10.786	3,171	2,510	16,467
	1924–25	11,347	3,030	2,279	16,656
Chemical Engineering	1921–22	4,444	1,406	1.204	7,054
	1922–23	3,207	1,082	1,097	5,386
	1923–24	2,738	1,067	929	4,734
	1924–25	2,478	884	746	4,108
Mining and Metallurgical Engineering	1921–22	1,824	481	590	2,895
	1922–23	1,545	514	602	2,661
	1923–24	978	447	473	1,898
	1924–25	898	333	332	1,563
All other Curricula and Courses of Study	1921–22	3,938	1,332	991	6,251
	1922–23	4,570	1,499	1,437	7,506
	1923–24	4,133	1,388	1,141	6,662
	1924–25	4,188	1,414	1,130	6,732

MEMBERSHIP OF THE SOCIETY IN DIFFERENT INSTITUTIONS.*

Institution.	No. of S. P. E. E. Members.	Institution.	No. of S. P. E. E. Members.
The Ohio State University	49	Armour Inst. of Technology	11
Purdue University	48	Washington Univ. (St. Louis)	11
University of Michigan	46	Rutgers College	11
University of Illinois	43	Univ. of Washington (Seattle)	11
University of Minnesota	39	Wentworth Institute	10
Massachusetts Inst. of Tech.	37	Michigan Agricultural College	10
Yale University	30	University of New Hampshire	10
Iowa State College	29	Oregon Agricultural College	10
University of Pittsburgh	28	Lafayette College	10
University of Kansas	27	University of Vermont	10
Texas A. & M. College	27	Virginia Military Institute	10
Kansas State Agri. College	24	University of Florida	9
University of Wisconsin	24	Tulane University	9
State University of Iowa	23	Columbia University	9
North Carolina State College	22	Union College	9
Cornell University	21	University of Delaware	8
University of Maine	20	Northwestern University	8
Tufts College	20	Stevens Inst. of Technology	8
University of Colorado	19	University of Utah	8
University of California	18	Brooklyn Polytechnic Institute	8
University of Nebraska	18	Syracuse University	8
Carnegie Inst. of Technology	16	Missouri School of Mines	8
New York University	16	Municipal University of Akron	8
Case School of Applied Science	16	University of Arkansas	7
Georgia School of Technology	15	California Inst. of Technology	7
University of Missouri	15	McGill University	7
Lehigh University	15	Michigan College of Mines	7
Harvard University	14	Brown University	7
Worcester Polytechnic Inst.	14	University of Texas	7
Pennsylvania State College	14	Duke University (N. Car.)	7
Rennselaer Polytechnic Inst.	13	University of Cincinnati	7
University of Pennsylvania	12	University of Virginia	7
University of North Carolina	12	University of West Virginia	7
Stanford University	11	Colorado School of Mines	6
University of Toronto	11	University of Kentucky	6

* This list is intended to show *only* the number of members in each institution who are members of the Society. It is not a complete list of the membership since many members of the Society are not connected with schools or colleges.

MEMBERSHIP IN DIFFERENT INSTITUTIONS.

Princeton University	6	University of Hawaii	2
University of Oklahoma	6	Bradley Polytechnic Institute	2
Virginia Polytechnic Institute	6	University of Indiana	2
Alabama Polytechnic Institute	5	Rose Polytechnic Institute	2
Colorado Agricultural College	5	University of Detroit	2
Southwestern University (La.)	5	University of Mississippi	2
U. S. Naval Academy	5	New Mexico State College	2
Johns Hopkins University	5	Gettysburg College	2
Northeastern University	5	Bucknell University	2
Montana State College	5	Rhode Island State College	2
University of Nevada	5	University of South Carolina	2
University of Porto Rico	5	South Dakota School of Mines	2
Pratt Institute	5	Vanderbilt University	2
University of North Dakota	5	University of Buffalo	2
University of Idaho	4	Clarkson College of Technology	2
Newark Technical School	4	North Dakota Agricultural Col.	2
Clemson College	4	Ohio Mechanics Institute	2
South Dakota State College	4	University of Toledo	2
University of South Dakota	4	Antioch College	2
Ohio Northern University	4	Riverside Junior College	1
Washington State College	4	University of Santa Clara	1
University of Wyoming	4	University of Saskatchewan	1
University of Denver	3	Trinity College (Conn.)	1
George Washington University	3	Valparaiso University	1
John B. Stetson University	3	University of Louisville	1
Louisiana Industrial Institute	3	Louisiana State University	1
Dartmouth College	3	Colby College	1
Cooper Union	3	University of Maryland	1
Drexel Institute	3	Massachusetts Agricultural Col.	1
Swarthmore College	3	Mississippi A. & M. College	1
University of Tennessee	3	New Mexico School of Mines	1
Rice Institute	3	Haverford College	1
University of Dayton	3	Allegheny College	1
Norwich University	3	Girard College	1
Marquette University	3	Villanova College	1
University of Alabama	2	The Citadel	1
University of Alberta	2	Utah Agricultural College	1
University of Arizona	2	The Hebrew Institute	1
Univ. of Southern California	2	University of Rochester	1
College of the Pacific	2	Denison University	1
Mount Allison University	2	St. Mary College	1
Univ. of British Columbia	2	A. & M. College of Oklahoma	1
Catholic University	2	Washington and Lee University	1

MINUTES OF MEETING OF DIVISION OF DEANS AND ADMINISTRATIVE OFFICERS, JANUARY 1924. (CONCLUDED.)

The meeting was called to order at 9:40 A.M. by Dean Arthur M. Greene, Jr. The first subject for discussion was the place of research in the curriculum of the school of engineering, and the subject was introduced by President C. R. Richards of Lehigh University, formerly Dean of the School of Engineering and Director of the Engineering Experiment Station of the University of Illinois. President Richards discussed the importance of research and the method of carrying out research at Lehigh University in accordance with his experience at the University of Illinois. Since the conference of deans these thoughts have been rearranged and form the description of the Institute of Research of Lehigh University as given in its Circular No. 1.

The Institute of Research of Lehigh University:

PRESIDENT C. R. RICHARDS.

1. *The Importance of Research.*

While knowledge has progressed by a process of slow accretion, recent developments in science and in the scientific mode of thought, through the stimulus of research, have greatly accelerated its rate of progress. To every scholar it is evident, however, that each new discovery extends the boundaries of knowledge without exhausting the possibilities for further advances. This accumulation of knowledge and its correlation and application to the affairs of life has had a powerful influence upon the advancement of civilization, and in the solution of many of the problems which affect the progress and happiness of mankind. These processes have established the sciences and their applications upon firm foundations, have revolutionized the theory of medicine and

the technique of surgery, have extended our insight into the minds and impulses of men, and, not least in importance, have broadened and sweetened the atmosphere of the human spirit.

The applications of the results of scientific research are impressive. Through them old industries are transformed and new ones created; man's ailments are diagnosed and cured; nature is rendered more abundant and her forces and resources are better conserved; and the life of society is enriched. The inception of many of those great enterprises which are transforming modern life has resulted from accidental discoveries or inventions; and their substantial establishment has been brought about through the courage and patient sagacity of great organizers and business executives. But in the development of many of these industrial and social organizations there comes a time when their continued success, or even their continued existence, may depend upon that form of systematic investigation which is called research.

Research implies the concentrated study of a particular problem in an effort to learn the truth concerning it, and it involves careful and extended observation and thought, the collection of data and their orderly comparison and reduction, the checking and rechecking of hypotheses, and the careful elimination of extraneous phenomena which accompany but do not affect the problem under consideration. Research is employed by the modern scholar in the advancement of learning, whether it be in the humanities or the sciences; and the knowledge thus secured is the basis of much of the progress in education, in the professions, in industry and in the public welfare.

The modern university is dedicated to research as well as to teaching. It must render to society the fruits of its scientific inquiries; and to its students it should promise instruction by scholars. Research is the tool of the scholar, and is fundamental to the work of the school teacher, who, to exercise the greatest possible influence in his field, must be devoted to the advancement as well as the dissemina-

tion of knowledge. They joy and the personal stimulus to the teacher, which comes from creative work, generally promote his success in the class room or laboratory, for his teaching inspires confidence and enthusiasm in proportion to his standing and prestige among men of his kind. Furthermore, since a university is an instrumentality to promote the work of scholars engaged in teaching and research, its standing is determined only by that of its component parts; if these are leaders and the creators of leaders, so is it recognized as a leader. Furthermore, "there is no other soil in which can grow the desire and the stimulus for truth that bears fruit in discoveries and in human progress comparable to that which is formed out of the common efforts and strivings of a great teacher and his students. We need in our universities to revive the notion that the primary function of the university is to teach, that true intellectual progress lies in the contact between the teacher and student, and that research in the best and truest sense would bear its finest fruits under these conditions and by this stimulation." *

2. *The Organization of the Lehigh Institute of Research.*

The Lehigh Institute of Research was created by an act of the Board of Trustees of Lehigh University on April 25th, 1924. It was organized to encourage and promote scientific research and scholarly achievement in every division of learning represented in the organization of the University; and in recognition of the need for further and more exact knowledge in science and in the applications of science to the affairs of modern life. It is believed that this organization will be helpful in stimulating interest in liberal and professional education; and that it will prove to be of value to the professions and industries of the nation.

With the growing extension and interdependence of various fields of industry, science and the arts, many problems require

* From an address by Dr. H. S. Pritchett before the Princeton Graduate School.

for their happiest solution not alone the experience and attack of one field of knowledge, but the vision and methods available in related departments. A research which seems initially to lie wholly within the resources of a single department often has need in its development to solicit the aid of the specialized methods of thought and work which lie in the domain of one or more other departments of knowledge. For the solution of problems of this type, and most large problems are of this type, the organization of an institute of research within a university is unusually appropriate.

The management of the Institute is vested in an Executive Board, consisting of the President of the University, the Heads of the several departments of engineering, the Heads of the Departments of Physics, Chemistry, Geology and Biology, and a representative of the College of Arts and Science and of the College of Business Administration. This Board is responsible for the establishment of general policies governing the work of the Institute, including its internal and external relationships; and for the approval of material submitted for publication.

For the present the actual conduct of research will necessarily devolve upon the members of the teaching staff of the University, who are encouraged and urged to devote a portion of their time to such work. It is expected, however, that in time, when the financial resources of the institution permit, the work of the members of the teaching staff may be supplemented by a Research Staff, composed of full time research assistants or professors, special investigators employed for a limited time on a particular investigation, and research fellows who will devote half time to the work of the Institute of Research, and the other half to graduate study.

3. *The Functions of the Lehigh Institute of Research.*

(*a*) *The Training of Men for Research Work.*—Possibly the most important function of the Institute of Research will be the stimulation of interest in advanced scholarship and the training of men in the methods of scientific research. The

demand for men conversant with such methods can best be supplied by educational institutions which have the facilities in faculty personnel, in library material and in laboratories for the training of these men. While it is a significant fact that many of the greatest achievements in science have emanated from the universities,—achievements in which advanced students as well as professors have shared,—yet these are but the by-products of a process which should be regarded as fundamental to the work of educational institutions.

The Lehigh Institute of Research will afford training in research methods to the following classes of individuals:

1. The members of the teaching staff of the University.
2. The members of the scientific staff of the Institute, including research fellows, research assistants and research professors appointed by the University and paid by it from its own funds or from funds for the purpose supplied by an individual, a firm or a corporation.
3. Graduate Students in the University.
4. Special investigators temporarily employed for work on a particular investigation.

The founding of research fellowships or research professorships in the Lehigh Institute of Research is a means for encouraging research and for assisting promising men to secure advanced training in the methods of research. The first fellowship of this kind has just been founded by the New Jersey Zinc Company and it is known as the New Jersey Zinc Company's Research Fellowship in Science and Technology.

(*b*) ***The Publication of the Results of Investigations.***—Shortly before his death, Dr. Charles P. Steinmetz stated that he had always felt it important to publish the results of his investigations as promptly as possible, in order "that others may build where I have left off." Unquestionably, the prosecution of research work, without the publication of the results thereof, represents an expenditure of funds and of effort from which no adequate returns are secured.

To preserve the records of its investigations and to render

them available to every one interested, the Lehigh Institute of Research proposes to publish and distribute from time to time bulletins presenting the results of investigations conducted by or under the direction of the Institute; and to issue other material which may be helpful to the various interests which the Institute seeks to serve. Under certain conditions, and with the approval of the Executive Board, reports of such investigations may be presented before professional or other learned societies and published by them.

(*c*) *The Conduct of General Research.*—It is hoped that in time the Lehigh Institute of Research may be provided with an endowment of sufficient amount to provide adequately for the conduct of research work of a fundamental character, the results of which will be real contributions to knowledge. It has been estimated that the annual budget for the purpose, including the salaries of the Research Staff and expenses of all kinds when the Institute is a fully developed organization, will be not less than $100,000. An endowment of $2,000,000 for research is therefore an urgent necessity.

Until an adequate endowment for research can be secured, the work of the Institute will need to be carried on entirely by the members of the University's teaching staff, with such appropriations for the expenses of the work as the limited funds of the University may permit.

(*d*) *The Conduct of Coöperative Research.*—In so far as its resources permit, the Lehigh Institute of Research will cooperate with individuals, firms, corporations or associations and with municipalities and governmental organizations in the investigation of problems of a far-reaching and fundamental nature whose solution will be of value to the engineering or other professions and to the public as well as to the agency supporting the investigation. Through such coöperation, it may be possible to undertake large and important investigations, whose cost would be beyond the capacity of the Institute to meet in any other manner, and thus to render unusual service in the advancement of knowledge.

Contracts for coöperative research shall provide that the

Lehigh Institute of Research will assume the general supervision of the contemplated investigation, contribute the use of its laboratories and equipment when these are not required for other purposes and prepare a report of the investigation for publication, all without expense to the coöperating agency; they shall further provide that all expenses for the salaries of investigators employed on the work contemplated, and for labor, special equipment purchased for the investigation, materials, supplies, power and water consumed and the expense of publishing the results of the investigation shall be paid from funds supplied, as agreed upon, by the coöperating agent. In general, funds for such research shall be paid as the work proceeds in such amounts as will insure the maintenance at all times of a reasonable working balance in the custody of the University Treasurer to enable him to pay promptly all bills rendered in connection with the work.

In all coöperative investigations the data secured shall be the property of the Lehigh Institute of Research; and none of them, nor conclusions based upon them, shall be published in advance of the publication by the Institute of the results of the investigation, except upon the written authorization of the Executive Board of the Institute. The coöperating agency may have access to these data for its own information, before the completion of the work, but not for publication.

While the officers of the Institute must be responsible for the methods employed in every investigation and for the results obtained, it will generally be desirable in coöperative research to appoint an advisory committee composed of persons not necessarily connected with the University or the coöperating concern, which will assist the Institute of Research in outlining the scope of the investigation, the methods of attack and the interpretation of the results. The members of this committee should be appointed by the coöperating agency, subject to the approval of the Executive Board of the Institute. The members of such committees are to serve without pay from the Institute; their expenses for travel,

incident to the work of the committee, shall be paid from the funds provided for the investigation.

(*e*) *The Conduct of Commercial Tests and Advisory Service.*—Not infrequently the University is requested to do commercial testing, to give expert advice or to conduct an investigation, the results of which are to be confidential and available only to the concern for which the work is done. The University does not solicit such work, nor does it desire to enter into competition with consulting engineers or commercial testing laboratories in the establishment of such commercial relationships. When requests for service of this kind are made to the University it will advise the employment of consulting experts, except in cases where it is reasonably clear that it may properly or desirably undertake the work itself. Thus the University may possess facilities in personnel and equipment, not readily available elsewhere, which will influence its decision in responding to requests for service. Naturally the University desires to render the largest service possible to the industries of the country, when this can be done without prejudice to its regular functions of teaching and research or to its relations with independent consulting experts. It should be emphasized, however, that it is more interested in the establishment of relations for the conduct of coöperative research for the advancement of knowledge, as described in Section 3 (d), than in devoting its energies to such activities as are discussed in this section.

Under no circumstances shall the results of commercial tests or investigations be published or otherwise employed for advertising purposes, except with the written approval of the Executive Board of the Lehigh Institute of Research.

Recently the Board of Trustees authorized the execution of contracts for the establishment of commercial relationships, under which, in consideration of the payment of a retainer, the University agrees to render certain services to the contracting party. When such services include extended consultation, or investigations or tests or research work, the University will charge for this service an amount sufficient to

cover the fee to be paid by the University to the member or members of its staff to whom the work is assigned, the salaries of temporary employees and the wages of mechanics and laborers employed on the work, the cost of materials and supplies consumed and of special equipment purchased or constructed for the work, and an allowance for general expenses and "overhead." When work is undertaken for a concern which has paid no retainer to the University, the charge for the service rendered shall include an item for the use of the facilities of the University in addition to the several items listed above.

Occasionally a firm or corporation may have need for tests or studies incident to the development of its plant or its product, which can best be made in its own works, and which will demand continuous full-time service for a long period of time from someone employed for the purpose. Under certain conditions, the University may grant a leave of absence without pay for a half or a whole year to a member of its staff who has been requested to undertake such expert service. The University recognizes that its instructors in engineering and science must secure practical experience to supplement their theoretical training. The plan here presented offers these instructors the opportunity for occasional industrial contracts without loss of academic position; and it is believed that it may be of some advantage to those concerns which avail themselves of it.

4. *Patents.*

Scientific research may lead to the discovery of some new process or the invention of apparatus having a commercial value. While Lehigh University is not conducted for profit, it has a large investment in its laboratories and physical plant, the benefits of which cannot properly be assigned to or exploited by personal or private interests. To preclude the appropriation by such interests of the results of discoveries or inventions made in the laboratories of the University, the cost of which has been paid from University funds or from funds

under the control of the University, the Board of Trustees of Lehigh University has approved the following regulations:

(*a*) Any member of the scientific or teaching staff of Lehigh University who has made a valuable discovery or invention as the direct result of his regular duties on University time and at University expense may be required to patent his discovery or invention, the expenses connected therewith to be borne by the University.

(*b*) Application for a patent to cover such discoveries or inventions shall be made in such cases as are recommended by the Executive Board of the Lehigh Institute of Research and approved by the Board of Trustees of the University.

(*c*) If a patent is issued the patentee shall assign the patent to the Board of Trustees of Lehigh University for a nominal consideration.

(*d*) A patent thus assigned shall be administered by the Board of Trustees in such manner as it may determine; provided, however, that if the patent is sold or a royalty for its use is paid, one half of the money thus realized by the University shall be paid to the patentee, and the other half assigned to the Lehigh Institute of Research for the furtherance of research.

(*e*) If a discovery or invention is developed in connection with a coöperative investigation (see page 12) and a patent thereon is secured in accordance with the preceding regulations, the coöperating agency will first be afforded the opportunity to purchase or lease the patent rights, or in other manner shown preferential treatment, in recognition of its financial assistance in the conduct of the investigation.

(*f*) These regulations shall not be construed to include questions of ownership in copyrights on books or of inventions or discoveries made by members of the teaching or scientific staffs outside their regular duties and at their own expense.

DISCUSSION.

H. J. Hughes: Perhaps you are satisfied that the methods which you propose to take care of patents will work out suc-

cessfully. We have been studying this problem and a committee is still working on a policy to cover research in all parts of the University and the question of patents is most difficult. We have two lawyers, one a patent lawyer and the other an ordinary corporation lawyer on the committee. In discussing this matter we felt we should protect both the professor in charge of the research and the University in this matter of patents. It was proposed at first that no patents should be taken out by the University. The material should be open to the public from the start but it was pointed out by the patent lawyer that after all a patent was one of the ways in which knowledge could be disseminated. The University now proposes to hold the ownership of patents which may be developed. What good will it do to the general public for the University to own patents? It seems to me that the policy proposed, taking ownership of the patent in the hands of the University, is not a good thing.

President Richards: You may be interested in this connection with a suggestion in this report which I have been working on for the Board of Trustees in respect to this matter. I have changed this material because conditions are different at Lehigh. At Illinois most of the work is done by funds supplied from public treasury and the public has interest in the activities of the institution which gives a different slant to the problem. In endowed institutions we are not concerned with public interest in the same way. As modified from regulations which we drew up for Illinois, any member of a scientific staff who has made discoveries or inventions on university time or with university equipment may be required to patent, the expense to be borne by the University. Applications for patent shall be made in each case as recommended by the Board of the Institute and approved by the Board of Trustees of the University. The patent is assigned and shall be the property of the University. If the patent is sold one half of the money thus realized shall be paid to the patentee and one half to the University for research. This is not intended to

apply to books or inventions or discoveries made outside of regular duties and at the expense of the person making them.

To go back to the history of this problem, there were on two or three occasions discoveries made in the first instance by the investigator. One of these was of far-reaching importance, the results of which were published and very shortly afterwards seized upon by the outside interests and patented. It is true that discoverers could have protested but the burden of proof was thrown on them and it would have been a matter of large expense to have contested it. Then in several other cases I recall investigations in which the problem was started, and the young man assigned to the investigation did well. He made a discovery which had not been anticipated. That is what research is for. This man was clear that what he was doing was for the Engineering Experiment Station. Later one of the corporations convinced him that what he had done was a result of his effort alone. He should patent it and assign it to the corporation and not give it to the University. It seemed to us then that we had better adopt some definite policy which would help in these matters. There was some question as to whether the Board of Trustees was the proper body or agency. I do not think it is. It could not be handled properly.

Another case, a man made a discovery on a particular drug which would be a great boon to mankind. I know the University felt that it would be advisable to patent the process and dedicate it to the public, manufacture this product and not have one concern get all of the benefit. The public would thus profit by the action.

Dean M. E. Cooley: This matter of research has been of great concern in this University for five years. We have a department of research. It was organized at the request of an industry of the State, an industry contemplating a million dollars for research. When it got before the Regents it developed that all results should be published. The result of this is that we have never had any contributions except $50,000 or $60,000 and that contributed by individuals. As to the mat-

ter of patents, that is a bugbear because any one who is having work done will come along with a patent application in his pocket. Publish when you like but his application is on file. The patent should be issued in the name of the University. The University should immediately assign it to the man who gave the money for it. That company should have the right to manufacture first. We should license if the patent is not assigned. There is nothing in the field of research that is so interesting and important at this particular time as what are you going to do in the institution supported by the public? On the other hand in institutions such as Mellon Institute we have corporations financing the support of the University. We are on the edge of failure because we cannot settle this question.

Dean Hughes: We propose that it should be made clear to the people financing a research that all they are entitled to is the results. They should pay the university for the use of its buildings. It was suggested that if a patentable idea was produced as a result of research it should be the property of the man who made it. The industry financing it should not have the right to patent it. This should be done by the man in charge of the research but the industry should have the first right to buy it. The ownership should rest with the man who made the discovery. If the people who finance it do not wish to buy it then the man should be able to do what he sees fit.

Dean Mitchell: We have a clear idea of this question. Research is permitted and encouraged and the man should take out the patent but under supervision and regulation if he is working in conjunction, as we do, with industry. Then it is to be assigned by arrangement. In the discovery of insulin the University realized the value to the world in its wide application. They took steps to protect the research in every way. What they have done is to put that on a solid foundation. The manufacturer of insulin arranged for its manufacture in other countries taking out patents themselves and the result is that insulin is given to the public at small cost. That is

the practical result of the principles which we follow and which are being advanced here.

Dean Cooley: The wealthy institution does not want help but just men trained in research. It is the small institutions that the corporations and individuals throughout the state want to help.

President Richards: There is a definite advantage in having the principle which I read recognized. When a man working on institution time and expenses makes a discovery he may be required to patent it and either assign it before or after issue to the institution. That is important. I have known men who have spent much time, involving neglect of regular duties in order that they might perfect devices which they could patent later. This is research but not the primary function of it. The investigator cannot have all the benefits. The University should assume the right to take it over and then develop it as they see best.

Dean Anson Marston: The Land Grant College Association adopted the views expressed by President Richards and he first brought it before the organization. The research work under way is largely by salaried men devoting their full time to research. Public supported institutions should be protected. I think we realize that they may require that the particular patent in some cases be used as protection if industry is developing the process. Our Chemical Engineering Department seemed to have made a discovery from a product of waste corn. If that be not patented then it might become the property of an individual corporation. The man made application for a patent on the process. If it is issued it will be assigned to the college. It will be necessary for the college to give it to some particular corporation and then factories will be erected throughout our portion of the country.

Dean Harold Pender: Please give me the interpretation of university time and university expense.

President Richards: If the professor uses facilities which the university provides the university must assume the right to have something to say about the patent resulting unless

the investigator pays the university for the privilege of using its facilities. At Illinois several of these cases were put up to us. We gave them the right to patent it if they so desired. It is fundamental thing where the commercial value is great.

Dean Whitehead: It is in the question of the importance of research to the teaching staff and its value in the development of the teaching staff that I think the S. P. E. E. ought to be most interested. I could not quite get from Dean Hughes just what his ideas were as to the personnel that is to be engaged in this matter of research. From where do they come? What are to be the qualifications upon which they are to be selected? Who is to do the training of them? It is well to say that we engage in research because value is seen in the stimulating effect that it will have upon on us. Are we training those people to whom we can turn to do things in such a system? I am not sure that I am going to adhere to the topic before the Society. Do our present methods of educating engineers do anything towards development of people best qualified to engage in engineering research? I do not think so. Our point of view is limited entirely by this demand of industry and commerce that we should furnish young men for their activities. I do not believe that industry has arrived at the point of realization of the important function that schools must have in the development of their men advanced in theory and research work. Not for a minute would I attempt to suggest that our sole function is to furnish these men. We should do so. We cannot exist without doing so. More is necessary. We see here a large industry engaging in the business of research. It is proper that it do so. The support and expenses necessary for this undertaking cannot be furnished by universities but they must be the only source from which the men come, the men who can take care of these laboratories themselves. It is not sufficient to say that men who can be entrusted with these research laboratories can be taken from our old laboratories. Pure science itself exists by the activities of engineering. We have new fields of science in which older laboratories and univer-

sities have no immediate interest and they have to catch up with our schools of engineering. Why should we not therefore in our schools of engineering engage in training these men for research. We can not support laboratories without giving first thought to the men who are going to direct them and engage in the business of engineering. We can not take our existing faculties and tell them to go to work. They can not do it. Trained qualifications for research can only come by the most intelligent and self-sacrificing advanced study. To what extent do we review engineering education? Very little I take it. To what extent do we stimulate and encourage the men to review the whole field? Very little. Why should we not attempt to formulate now something in the way of a skeleton of a complete curriculum which should provide a course for the furnishing of research to young men who must go into the industry, who are necessary for it and who furnish the reaction by which we live, this course should provide and stimulate and point to what is needed in the way of training and requisite qualifications for undertaking these advanced phases of our work. I regard the training of the teacher as the essential duty of these advanced courses and that we should look as much as we can in our selection of teachers to the men who have given attention to the advanced field. I do not believe that proper qualifications for teaching of young men who can go forward can come as well from the type of teacher that we have in many of our schools now as from the man who has actually given and spent his life under the direction and in the atmosphere of research in his own field. These efforts give him the fitness for the inspiring of young men. The immediate answer to that is we do not need a great many of such men. We need more of those of general training. We should not limit ourselves to the discussion of real value of four or five year courses without providing somewhere the formation of an advanced program and give it what we think is the proper method by which we can send such men forward as those who may be needed by great research undertakings.

My thoughts on the curriculum are:

Two years of college work for admission to any course in engineering; Eliminate any technical subject in the first two years. Include mathematics, English, Physics and Chemistry. Have new admission requirements—but two years of college work for admission to any professional course. Two years more with whatever you can put into them for a bachelors degree. Give this degree at the end of four years. On top of that I should say two more years to the masters degree or professional degree. I am not in sympathy with one year for the masters or professional degree. Another year or two or three as may be required for the man to acquire his capacity for individual and productive power. This is not radical but if we put it down we can point out to the manufacturer and and industrialist that we can give the bachelors degree and the graduate is in excellent position to go to work in four years. If they want our bigger men stimulate these men to go forward.

Johns Hopkins has for years considered its particular function to be that of scientific research. The policy is absolute independence to the worker. I do feel and believe that anything in the way of restriction upon the men to whom you are looking for special facility in the way of development immediately kills the thing. If you are looking to the men for the solution of a particular problem which is hidden you must do everything for them. Selling research work is a difficult thing to carry through it you are going to look for the best research ability.

After the discussion by Dean Whitehead, Dean Greene turned the meeting over to President Walker for the discussion of the work of the Board of Investigation and Coördination. President Walker then introduced Professor Charles F. Scott, Chairman of the Board, and Mr. W. E. Wickenden, Director of Investigations.

Mr. W. E. Wickenden, the Director of Investigations of the Board of Investigation and Coördination of the S. P. E. E., reported on the work of the Board and the plan of its

work. The report made by Mr. Wickenden has already been included in a paper by him published in ENGINEERING EDUCATION for February, 1924, and reference is here made to that paper on pages 262–273 of our bulletin.

Mr. Wickenden explained the establishment of the Board of Investigation and Coördination, indicated some of the factors in the making of an engineer, and certain features of the engineering curriculum which should exist for the proper training of the engineer.

Mr. Wickenden reported that the Board of Investigation and Coördination made the following propositions:

1. At the several engineering colleges appoint local committees to coöperate with the Board and undertake studies according to local interests and available resources, which would be in the following areas:

(*a*) The background of engineering students.
(*b*) The circumstances attending admission and early adjustment of students.
(*c*) Extra curricula activities.
(*d*) Personal and professional qualifications of teaching staff.
(*e*) Distribution and circumstances surrounding graduates during first two years out of college.
(*f*) Distribution and records of alumni of more than two years' standing.
(*g*) Opinions from alumni on elements of value in engineering education.

2. That several committees of the Society undertake studies with the coöperation of the Director and local committees as follows:

(*a*) Committees on professional subjects to study degree of specialization and specific training in preparation for early duties, and the propriety of granting professional degrees without required study or graduate work in residence.
(*b*) Committees on related sciences and English.
(*c*) Committee on admissions and freshmen to study reasons

for choice, present state of vocational information and guidance with reference to engineering and determination of degree of aptitude for engineering study.

3. That the Advisory Council of national engineering societies consider what are the standards and objectives in engineering education which are the concern of the profession at large. This committee may wish to consider:

(*a*) The minimum standard for recognition of an institution as a college of engineering.
(*b*) The general studies underlying professional training of all engineers.
(*c*) Common technological studies for all engineers.
(*d*) Amount of specialization desirable.
(*e*) The contribution of the profession to vocational information and guidance.
(*f*) Qualification of engineering teachers.
(*g*) The economic and professional status of engineering teachers.
(*h*) Nature and ethics of professional obligations.
(*i*) Contacts between professional societies and student groups.

4. That the joint advisory committee of the National Industrial Conference Board and this society should continue its study of the industrial demand for engineering graduates, their method of introduction to industrial life, and the development and dissemination of information concerning fields of industrial effort.

5. That the Bureau of Education should be requested to continue and extend its valuable statistical survey of engineering curricula and information regarding the number of men graduated.

After a very able presentation of the matter above by Mr. Wickenden the committee adjourned until the afternoon.

SATURDAY AFTERNOON SESSION, JANUARY 26, 1924.

Meeting called to order at 2:26 by President Walker.

Discussion of Mr. Wickenden's Report.

Dean Greene: Is it the intention when you send letters to various institutions asking them to form local committees to send with them the things which you wish investigated so that each may have something to do.

Mr. Wickenden: Yes. I will take the material presented this morning and work it up with exhibits drawn from investigations here at the University of Michigan into a prospectus for committees of the Society and at the local institutions and indicate to them our program. I shall not point out which are the elements for them to work out.

Dean Greene: The questions you have outlined this morning are quite proper in form and extent and I would be very glad to have them answered. I am glad the questions are to be asked. What percentage of returns can you expect to get?

Dean Cooley: We have kept up this inquiry at Michigan and we have replies from quite a number, about 90 per cent. of our alumni.

R. L. Sackett: Just before Christmas I sent out a questionnaire to 2500 and when I left I had received 750 replies and replies coming in every day.

Dean Marston: So far as I can say the institution with which I am connected will do all we can to coöperate. At Ames the work of research in connection with this would best be carried on as research project of our engineering experiment station which would lead to some publications. Is there any thing about a plan like that which would be out of harmony with the general plan?

Mr. Wickenden: The objective of this is not a report. It is not our hope to accumulate a mass of material to put out in a volume. Our plan is to publish material as rapidly as units of sufficient size and importance from month to month through the bulletin of the Society, ENGINEERING EDUCATION.

Dean Marston: That answers my question. In some work done by the Bureau of Education, there is work which should be done by some other agency. I do not think that by statistics we are getting at facts. They ask early in the fall for the registration of 1923–24 which would go into the records as statistics of past year. That early in the fall you cannot get data. In any engineering school the number registered in the freshman class does not give the number entering the engineering college. At Ames the registration in the freshman class in the fall was greater than appeared for the entire year when the catalog come out. A considerable number of those men were classified as freshmen and had been there during the past year. Freshmen with deficiencies, appear as sophomores in the catalog. This is true in all cases. Now I wish there could be some study made of this. In this connection in one of the studies the Bureau has asked for information of 1863–73 and corresponding data.

Dean Cooley: We start at 1923 and work back 20 years. I came here in 1881 and had only one degree in 4 or 5 courses.

Dean Marston: It happens that a large number of engineering schools began operation between the close of the Civil War and 1870 and that would be good to look at that year for the first. The date just before the war, 1860, would be interesting and 1870 immediately following would be interesting. Ten year intervals would be interesting.

Dean Hughes: What do you propose to do with the statistics when you get them? I cannot see how we are going to gain a great deal about this investigation.

Mr. Wickenden: As one example, if we can trace out the changes from year to year in the number of degrees granted I think we will find there has been no constant increase in 20 years in the number of men graduated in civil and mechanical engineering. I think it will show that there has been an increase in diversification.

Dean Pender: Has any attempt been made or is there any plan to correlate the information this morning in regard to

the background of students entering engineering schools? With what these men actually become in engineering profession?

Mr. Wickenden: Yes.

P. F. Walker: Each of our institutions would probably want to make a study of its faculties and of its graduates for the years. These are points perhaps which we would want to study any way.

President McNair: I hope that each institution that finds it at all possible will study the conditions in full. I hope they will make a careful study of the material that comes to it over as wide a space of time as convenient. Then follow through the correlation, the character of the material which comes to the institution, what has happened to its graduates and how their training in the institution seems to have influenced them in later life. The more data we get the better, when these data are good. As the thing stands now we are getting cooperation which we think is derived more or less from experience. We do not have the very certain knowledge of any large body of facts and I think this Board should be fact-finding constantly and with the help of the colleges we can find out what the facts really are.

President Howe: If we are to give facts it seems to me it will be necessary for us to have complete statement from Mr. Wickenden. The facts must be the same kind from each institution.

Resolutions.

After the discussion of the report by Mr. Wickenden the chair was resumed by Dean Greene, who called for the report of the Committee on Resolutions.

The Committee on Resolutions made the following report:

"This meeting of the Division of the Society for the Promotion of Engineering Education of Deans and Administrative Officers assembled at the University of Michigan desires to place on record its deep appreciation of the hospitality and courtesies of those various persons and bodies which have

been each a large factor in making this meeting the success it has been.

"The Division especially desires to express its grateful thanks

"To: President Burton and the Board of Regents of the University of Michigan for their kindness and courtesy in connection with the holding of the meeting at this great educational center.

"To: Dean Cooley and the members of the Faculty of the College of Engineering and to Professor A. H. Lovell, Chairman, and the members of the Committee for their reception and for the very excellent arrangements for the meeting.

"To: The University School of Music for the opportunity of listening to such an excellent musical entertainment.

"To: The Board of Governors and officials of the Michigan Union for their hospitality and the attention to the comfort of the members, and

"To: The President and the members of the University Club for courtesies extended during the duration of the meeting.

"D. ANDERSON,
"J. B. WHITEHEAD,
"C. H. MITCHELL, *Chairman.*"

The resolutions were unanimously adopted. The chairman then introduced Mr. M. W. Alexander, Manufacturing Director of the National Industrial Conference Board.

The Relationship of Engineering Education to the Industries: MAGNUS W. ALEXANDER, New York City.

Although myself a product of Engineering Education and for almost thirty years active as an engineer, manufacturer and executive, I am not now engaged in strictly engineering work, but in research studies relating to the economic problems arising out of and affecting industry. Thus, as a student of industrial affairs, I am keenly interested in the problem of Engineering Education because I realize that the bulwark of industry is a scientific attitude and scientifically trained men. I realize also that, because further development of industry

tends along even more complex lines, this bulwark will loom still more imperatively in the future.

Industry, moreover, is interested in Engineering Education because that education is one of the important arteries in the industrial system. If it should prove weaker than any of the other arteries, it will to that extent weaken the whole system. If, on the other hand, it will prove stronger, it will by its influence stimulate and strengthen the industrial system all along the line. Putting it in another way: While Engineering Education is of course a part of the country's educational system, it is also a part of the industrial system, and not apart from it. Its primary function is that of enriching the national life by specialized educational training, but by its more direct approach to one of the great professional activities and its specific aim to train men for an engineering career, Engineering Education plays an important part in the country's industrial structure.

Looking at the world broadly, we know that the basis of our modern existence is economic organization. That organization, evolving from the industrial revolution at the end of the eighteenth century, has become complex and many-sided. Economists and historians lay great stress and emphasis on the industrial revolution, but too often they consider it as an event which filled a decade or two. I believe, quite to the contrary, that the industrial revolution, which began about the time of the epochal inventions of Arkwright who changed the character of the textile industry, of Watt who invented the steam engine, and of Stephenson who constructed the steam locomotive, is still in progress and is still forging great changes in the economic life of the civilized world. While it is England's great glory that she gave to the world the *machine system*, it is the United States which has carried that system a step further by developing *mass production*, thereby making available to persons everywhere a more plentiful supply of goods at prices within their reach. This availability of goods, and of tools and machinery with which to produce them, has made possible not only a greater leisure and a wider oppor-

tunity for enjoyment of life, but a steady rise of the standard of living.

Engineers have played no small part in this development of industry and mass production. Working with clarity of mind and an understanding of the important facts of science, they have coöperated with broad-visioned industrial executives to keep the industrial revolution from becoming a closed book. Great promise of further "revolutionary" changes in industry for the benefit of mankind and a still higher standard of living, lies in the scientific equipment, the integrity of mind, and the broad outlook which the engineer can bring to his task, and in the constructive vision and enterprise of America's industrial leaders, their receptivity to science, and their interest in the efficient training of men for industrial service. Together they can meet the challenge of the world for a better economic life in which the leavening elements of the moral and the spiritual will have their proper and important place and influence.

The economic aspect of modern life is fundamental; substantially all of us must render service through work to earn a livelihood. This service may take many forms, but its effective expression in our time and age is made possible through the existence of an organized system of industrial society. That system encompasses the whole world, for the civilized world is but one economic unit, highly organized, quickly sensitive and interdependent, in which each land and people play an important interrelated part. Those who live in the cities may know nothing about how to raise the food or make the clothing, or produce the various other articles that we find essential in our daily life, while others, hundreds or thousands of miles away, may produce these things which we all secure in exchange of services, rendered possibly by economic organization.

The engineer who is going to serve industry effectively must take the broadest outlook because the outlook of industry itself is as broad as the world. A strike of sheep shearers in Australia quickly reflects itself in a lessened supply of wool and

woolen goods and, in turn, in a higher price of woolen clothing in the United States and other countries. A strike of coal miners in England results shortly thereafter in the closing of Italian factories dependent on England's coal for power supply. Similarly, a strike of American miners results in a greater demand for England's coal and a stimulus to England's coal carrying trade. A discussion in the Congress of the United States over the proposed curtailment of Italian immigration immediately arouses the Italian people because the large sums of money sent by Italian immigrants in the United States to Italy play a major part both in the welfare of dependents there and in the ability of the Italian government to pay the interest on its indebtedness to the United States and to other countries. Riots in India affect the price of burlap in the United States just as quickly as an earthquake in Japan boosts the price of silk and makes for unsettlement in the silk industry in the United States.

Such instances could be multiplied but these indicate sufficiently the interdependent character of our existence. Whereas, under the domestic service system of household economy each family unit was more or less sufficient unto itself, today in our system of machine and mass production we are no longer independent but are interdependent; and more than ever broad vision and well-grounded knowledge are essential for sound and safe economic development.

If we now turn to engineering as a profession, we find that in the last fifty years a great change has been going on. Not so long ago the word "engineer" had a very limited application. We knew of civil engineers, later of mechanical engineers, and still later of electrical engineers and chemical engineers. To-day, the scope of the engineering field is very broad and its development promises to go on in response to a growing complexity of, and an increasing specialization in, industry and to a widening application of the engineering sciences through human effort. Even in the field of public activity the engineer is becoming a very potent factor, and quite properly so. Is it not more appropriate that the heads

of public departments of roads and canals, of sewage disposal and building construction should be engineers rather than lawyers or political henchmen? Moreover, many whose activities have no basis of scientific or applied engineering training call themselves engineers to indicate to the public that their work is exact, reflecting and forward-looking.

Engineering has been undergoing the same broadening influence that industry has, and has been an asset in that broad development because of the scientific attitude it has maintained and the constructive service it has rendered. That spirit of thought and action must be preserved and quickened in preparation for the greater things to come, and Engineering Education must keep in step with this development and must in a sense, even lead it. Since the chief application of engineering is to industry, Engineering Education, in order to be of real service to industry generally, must foresee industry's needs and to a large degree adjust itself to them. What is the nature of these needs?

Five items are of fundamental importance in any industrial organization. They are: MEN, MANAGEMENT, MONEY, MATERIALS, MACHINERY—the five big M's. Machinery and materials present nothing new to the engineer; their consideration forms a basic part of an engineering school curriculum and always will. The other three items, however, have heretofore come in for lesser consideration, but the question of management and industrial organization is now being stressed more and more. Among the reasons why the human and management aspects of engineering education have commanded heretofore but scant attention is the fact that the human aspect in industry has been coming to the forefront only in the last few decades along with the development of large-scale production, and management itself has emerged as a concrete entity in the same period. However, an adequate understanding of these aspects will never be obtainable in the schools alone, but must be acquired largely through practical experience in industrial life. It should, nevertheless, be the function of the engineering school to give the basic understanding and to

arouse interest in and even a desire for work relating to the human and management aspects in economic society, and thus to lay broad foundation stones on which practical life may safely be built. In such coöperation between the engineering school and the industries lies the promise of a greater and more just reward to the engineer in academic halls, in the technical and scientific world, and in managerial and executive leadership.

The development of effective methods under which both, the engineering teacher and the industrialist, could each help the other, and the necessity of adopting educational and training activities to meet broadly the ever-changing conditions and requirements of industry, are the problems that confront us and call for careful consideration of an adequate approach to a solution. Common ground must be found on which the engineering teacher and the industrialist can meet to formulate policies designed to avoid waste of time and energy and misdirection. Engineering schools and industry must coöperate in the development of such collegiate educational preparation of our future candidates for engineering work, industrial management and leadership, and of such applied educational continuation work in industry as will enable these young men to grasp the complex problems of industrial operation, thus providing for their own more speedy and fruitful assimilation into the industrial structure of our country. A keen perspective must be developed by the engineering school both in respect to the practical side of engineering and the proper interrelation of the economic forces in industry, for this is demanded more and more of those who wish to succeed in the industrial field.

By virtue of an adequate economic and a broad and analytical technical training, engineers must be prepared to serve the public, through their industrial connections, in helping:

(*a*) To devise means of lowering costs of production—and that involves the problem of manufacturing.

(*b*) To bring prices of the producer and consumer closer to-

gether—and that relates to the problems of transportation and distribution.

(*c*) To make possible lower costs to the consumer—and that reflects itself in economical marketing.

(*d*) To harmonize the interests of the employer and employee in order to enlist the coöperation of both in securing lower costs to the public—and that is the problem of labor relations.

There is urgent need of such public service and every industrial enterprise, large or small, will increasingly become concerned in the solution of these phases of industrial progress.

Looking back over the industrial development of the country, a change of ideals in industry has made itself evident in the last few decades and the signs point to a further gradual change in this respect which, in turn, will call for a new conception of the requirements of an engineering education. It is likely that industry may soon be confronted with the necessity of shifting its task from that of "development of mass production" to that of "sustaining a developed mass production"; if so, consideration of the human and management factors must be approached as a matter of far more than secondary importance.

Necessity in some cases, and in others the realization that the heart of our social structure is in the industries and that the foundation of society is education, has prompted many of our leading industrialists to study seriously the problem of the economics of industry with emphasis on the human factor in it and the aid which engineering schools can give in this regard. A corresponding interest among leading educators gives evidence of their endeavor to adapt the educational program more fully to the task of training men to be capable of visualizing, and assisting in, the solution of these problems of industry. It is now more fully recognized that training along the lines of a narrow and purely technical engineering course lacks the breadth of vision necessary to comprehend the economic and sociological problems of modern

society as they play upon industrial conduct, as well as to meet the technical requirements of production.

In view of these facts, it is clear that close coöperation between the engineering teacher and the industrialist is a matter of growing importance. In the endeavor to provide more and more adequately educated engineers for the need of industry (taking the word in its broad meaning), and especially for industrial leadership, consideration must be given to many avenues of coöperative approach to the problem of the proper relationship of engineering education and the industries, of which the following are some that seem to be more or less obvious:

1. Further development of coöperative engineering courses, like those now in operation along somewhat different lines at the University of Cincinnati, Harvard University, Massachusetts Institute of Technology, University of Pittsburgh and other collegiate institutions, aiming to give young men with an adequate educational preparation a part-time college and part-time industrial, coördinated engineering training.
2. Employment, under adequate guidance, of engineering colleges teachers and students during summer vacations, in order to clinch during summer periods their understanding of, and interest in, problems of industrial production, both as an aid to the educational work of the college and as simplifying methods of recruiting junior engineers for industry.
3. Periodical conferences between college faculties and personnel managers in the industries in order that problems of each may receive the joint consideration of both as a benefit to themselves and especially to their common object—the junior engineer.
4. Practical means through which college men of recognized teaching ability, who had left college to enter industry, will find their way back to the college for more effective teaching through a better understanding industrial problems and requirements, thus, in part, correcting the depletion of capable instructors' ranks because of better inducements offered by industries than colleges could afford to give.
5. Arrangements under which industrialists would enable

some of their capable non-college trained employees to exchange, temporarily, industrial activity for complete or partial engineering collegiate training after which to return to more responsible positions in industry.

6. Annual exchange of some engineering teachers in colleges and some practical engineers in industry to fill each other's places under a plan providing for continuance of the financial obligation by college and industry to their respective exchange-men, even though these men will temporarily have come under other jurisdiction, all aiming to bring a more practical viewpoint into engineering education and a more scientific spirit into industrial engineering.
7. Closer relationship between the engineering school and the industrial establishments in a community, with special reference to the many small industries which form the industrial backbone of the country, to arouse the latter's interest in educational work, to open new fields for engineering trained men and to promote interest in modern engineering methods upon which the survival of small industries in economic society, with its growth of corporate management, will increasingly depend.
8. Lectures by outstanding industrial executives as a part of regular lecture courses at colleges, that students may be stimulated in their preparation for industrial life and may gain a fairer knowledge of broad industrial processes and problems and the place and importance of management in industry.
9. Joint studies by schools and the industries of the characteristics and duties involved in the various positions of technical and supervisory responsibility, and of the fundamental qualifications to fill these positions.
10. Coöperation between leaders in engineering education and leaders in the industries for broad discussion of the problem in which they must recognize their joint interest, namely that of preparing young men for a professional career in the productive field of human activity.

These ten varieties are cited merely as examples of 57 varieties that could be suggested for effective relationship of engineering education and the industries. No originality of thought is claimed for these suggestions rather the hope and belief is expressed that they are already being worked out in prac-

tice. Their re-statement here would then be backed by practical experience and thus would focus more earnest consideration on an increasingly important problem—how to supply the well-trained brains to the industries in their growing competitive struggle at home and abroad and for their adequate integration into the social organism of the time.

The National Industrial Conference Board, representative of American industry generally in the field of economic research, made a definite beginning in securing coöperation between the leaders of engineering education and the leaders of industrial activity when about a year ago it joined with the Society for the Promotion of Engineering Education in appointing an Advisory Joint Conference Committee of educators in, and administrators of, engineering schools and of executives in principal branches of industry, thus bringing broad scientific attainment and broad experience into happy relationship as bearing on a study of a common problem. Last August, the Conference Board issued its first report on "Engineering Education and American Industry"—Special Report No. 25—in the Foreword of which it states:

"Proper selection and training of new men for positions of administrative and technical responsibility in industry are vital to the economic development of our country. The growing complexity of industry, as of all society, adds continually to the burden of those who occupy leading positions; hence they must be selected with increasing care and given a steadily broader and more thorough training."

The report is replete with interesting pictures of the present situation and with pertinent suggestions for the solution of the common problem in respect to which the report closes with this statement:

"It is rapidly being recognized that during the last period of engineering education and the first period of engineering practice, the engineering school and industry have a common problem; and the closer the coöperation during this period of transition, the more beneficial will be its result for the young man, the school from which he graduates and the industry which he is planning to serve as his life work."

The study was undertaken by the National Industrial Conference Board with the approval of its Advisory Committee because of the realization that, whereas it may be said that engineering education at one time effectively trained young men to meet the then prevailing requirements of industry, these requirements soon changed in scope or character due to the great changes that took place in industry which, as we know, is quickly responsive to improvements and new inventions of processes and machinery and to changing social and economic conditions and conceptions. Educational processes obviously cannot respond as quickly and fully to such changing requirements, with the consequence that the one time synchronism between engineering education and industry of necessity must turn into asynchronism; and then a reappraisal of the situation and a new re-alignment are required. The late World War with its great influence on industrial production has strongly tended toward throwing industry out of alignment with engineering education, and the study of the relationship of Engineering Education to American Industry by the Conference Board is the response to the need for new appraisal and, if need be, for new synchronizing effort.

The leaders in engineering education and the leaders in industrial activity may well dedicate time and thought to this important task of national importance and of patriotic motive.

Training for Activity in Non-Professional Matters: A. A. Potter, Dean of Engineering, Purdue University.

Dean Dexter S. Kimball, of Cornell University, in discussing "The Content of a Liberal Education" before the 1923 Convention of the Association of Land Grant Colleges brought out the following facts:

"To-day many so-called cultural and humanistic studies have a decidedly practical aspect, while many studies formerly classified as strictly utilitarian are now known to be very useful in the development of mind and character. . . . but the affairs of men are many and varied and no man can be said to have a liberal view of humanity who does not know

what its vital interests are. If, therefore, he is to be liberally educated he must keep himself informed as far as possible regarding all important social, political and industrial movements. What, therefore, is vocational to one man is liberalizing to another. . . . With the advent of modern industrial methods came a tremendous change in our social and political organization and our point of view regarding the philosophy of existence. . . . As a consequence of these new methods and ideals there have arisen problems in social and political organization that have no counterpart in history and differ from anything contemplated in the old humanities and classical studies. . . . They are real humanities; and the older humanities and classical studies will survive only as they can be interpreted to assist in these new problems or inspire men to higher planes of thought and action. . . . The great majority of college students, men and women, in all courses, are necessarily undeveloped mentally; and whether they eventually become liberally educated men and women depends upon many things beside the particular studies they pursue at college."

The following non-engineering subjects are included in all engineering curricula, except Chemical Engineering, at Purdue University:

3 semester hours of English per week throughout the first two years.

3 semester hours per week of Modern Language or of History during the Freshman year.

2 semester hours per week of Modern Language or of Psychology during the Sophomore year.

3 semester hours per week of non-technical electives during the Junior and Senior years. These must include at least one semester of 3 hours per week of Economics and also one semester of 3 hours per week of History if the student did not elect History during his Freshman year.

The above arrangement requires every engineering student to devote 34 semester hours or about one fourth of the total semester hours required for graduation to non-engineering subjects.

Students pursuing the Chemical Engineering curriculum at

Purdue University are required to take only three semesters of English, must take two years or two and one half years of German and have a total of only six semester hours of non-engineering subjects during the Junior and Senior years. This curriculum includes less than 20 per cent. of non-engineering subjects.

The courses in History offered to Purdue engineering students include the study of European History from 1870 to the present time, Social Sciences with particular stress on the American Government, American History, Municipal Government, Diplomatic History of the United States, and Latin American History. The main purpose of the instruction in History is to widen the horizon of the student, to give him a broader outlook, and a better comprehension of world affairs.

The courses in Economics besides the three hour required course include: Money and Banking, Transportation, Economics, Corporation Finance, Labor Problems, and Finance.

The attention of engineering educators is called to a course "Problems of Citizenship" which is being administered for the benefit of all Freshman students at Stanford University, California. It is considered one of the most important of all the required courses at Stanford. The syllabus of the course calls at present for ninety lectures to be given by men from different departments of Stanford University. The following general divisions will indicate the design as well as the scope of the course:

Bases of Civilization, including such subdivisions as Physical Environment of Modern Man, Man's Conquest of Nature, Science and the Scientific Method, and Fundamental Social Institutions; Historical Development of European and American Society, including such subdivisions as European Expansion and Exploration of the Americas, Migrations of Peoples, Beginnings and Development of an American People, and National States of the Modern Period; Political Equipment of the Citizen, including such subdivisions as Political and Civil Liberty, and Origin and Development of

Democracy, Public Opinion and Popular Control in Government; Political Institutions and Problems, including Nature of State and Government, Political Parties, Legislative Organization, Colonialism, Local Government; Economic and Social Institutions and Problems, including Industrial Combinations, Regulation of public Utilities, Foreign Trade, Conservatism and Immigration.

In the earlier part of the course special attention is given to the Freshman as a new member of the University community. Special lectures are given on the taking of notes, the use of the library, and the general opportunities for University study.

The course is administered at present as follows: Three lectures are given every week to all Freshmen in one large section. One hour per week is devoted to a quiz when the class is broken up in groups of 30 and in charge of instructors who come to Stanford University for this special citizenship work.

Every student is supplied with a Syllabus of Lectures and References, which includes general information, instructions, and outlines of topics covered in every lecture.

The purpose of this course is one of service to the State. Those in charge of this course feel that this type of course is giving the student a conception of the State and his relation to it.

The Stanford University type course in the "Problems of Citizenship," if properly administered, will widen the horizon of the student. It is my opinion that this type of course if scheduled for engineering students during their Junior or Senior year will accomplish more than if required during the Freshman year. The type of non-professional training for an engineering student should have as its chief aim effective citizenship and habits of thought which will lead to sound judgment upon public questions.

DIVISION OF DEANS AND ADMINISTRATIVE OFFICERS.

A Course in Government: PRESIDENT IRA N. HOLLIS.

Last spring I went to a luncheon that was given to one of the great preachers of the country who had been all around the United States. There were present well known representatives of all professions. I was very much struck by the conversation there. From the statement of the preacher of his experience with the American people there came a debate to attempt to show the American people too democratic. I left that room discouraged carrying with me a composite picture of these men with regard to the future of the republic. There are many reasons for that. I think this is a wide subject. I spoke in California and told something of the same need. I do not believe that we should have any doubt of the future of our republic simply because it contains in it these microbes that will set up a war against the microbes that may pervade our system. I am not going into detail of a course I gave this term and which your chairman has asked me to describe. I took over a course in government because of the illness of the instructor. I have talked a great deal with people who have been presidents of our societies and I think there is a feeling that the engineers of this country cannot work together. I know that the great national societies have evidence against that, but ask them to coöperate with each other and you reach this difficulty. I wonder if our education is of such nature as to make us want to work together. I think we have a cure in our own hands. This meeting is the beginning of that cure and it lies in the education of the young men. The absence of teaching to our young men some conception of their own government is one lack of our system. I took over this course in government and last Thursday I had an examination and asked them to write an essay on democracy. State what its dangers are and state why we should hope to avoid the difficulties of the past. I don't know what their answers will be. I could not write this myself. American democracy contains within itself elements which may become dangerous if permitted to go too long. I do not know how this is answered.

I gave this course as a means of helping myself. It may produce a desire and effort to make better citizens. The course was given by the students themselves in the nature of 15 to 20 minute lectures by members. That was given to the men so that they could get up before the class and state their views without being misunderstood. A Japanese was to have spoken on taxation. He came to me and said I do not know anything about taxation. I told him to take 15 minutes and talk about himself. I believe that there we have a possibility of teaching that has never been exploited.

First these young men who graduate from engineering schools are to be citizens whatever their technical attainments may be. What do we care for them as citizens? We recently secured $10,000 for an industrial scholarship. That will take care of the instruction and tuition of student. What will it come to if we go to a meeting of highly educated men and find discussed the success of American democracy. I cannot help but feel that is one of the directions in which we want to extend our education. I have taught many subjects but this is one of the most essential that we neglect very much trusting that the high schools may have done it. In this course I got a lawyer to give 16 lectures on the influence of engineering on the permanency of government. If we study with that point of view we will find in every case that the rise and fall have been coincident with engineering. I may call it the industrial life of the nation. We speak of it as if it were recent. I believe that in a study of government we have the motive that would presume the uniting process among the engineers of this country. Many are engaged in technical work but it is individual and not as one thing in which they must be united which is the success of the country. We know little of that success unless we know conditions that produce it. How much of that is done in engineering schools of this country? I was fortunate in getting to speak to us a legal advisor and I have never seen the kind of interest that was raised by him. No failure in the class. Does that not pre-

sent a possibility that we ought to cultivate in the future? The influence of the engineer upon government upon which the permanency of American republic is going to depend! The states are going to be held together by the profession of engineering. Can we teach that to the young men before they leave the engineering schools? Is the teaching of engineering attractive enough to attract to it men who want to stay? My difficulty is to find teachers, especially young men, who want to stay. How far is that true in this country? Is the profession of teaching sufficiently attractive to bring men into it who will make of our engineering schools all that they want of it?

DISCUSSION.

President McNair: I am in agreement with President Hollis in the matter of finding teachers. If you get the right type to teach engineering subjects the job will be very easy. If you do not have the right type the job will be difficult. If you are going to get young engineers interested in civilization, duties as a citizen of the local community in which they live, in their duties to the people, you must first have them under men in the class room who are also interested in these questions. My experience is that the average teacher is not interested in citizenship, in his civic relation to his community. Much less is he interested in talking to his students about that particular subject. We have no course in government in our institution. Economics is given for the first time this year. No man can get his degree without taking this course successfully. That course is not the stereotyped course. There is some attempt to apply it to the things he will meet in after life. One of the things is taxation. Some effort to make him understand it and then his responsibility. Yesterday the Bok Peace Plan was laid before the entire student body for a vote. I do not know the result of that vote. Quite apart from your idea and mine there seems to be a part of the student, that something that was not technical, that

should be discussed so that he might be interested in it and that something is his duty as a citizen.

F. E. Turneaure: It seems to me that the general purpose of one technical elective is not to give students instruction in a particular study that they must take whether they want to or not. One good effect that students come to discuss among themselves what they will take. The selection of the course is not so much the course as who teaches it.

Harold Pender: At the University of Pa. we have the Wharton School of Finance and Economy. In our junior work for electrical engineers we want our men to find out what that school is doing. We have organized a course that we call Current Social and Political Economic Problems and 8 men of the Wharton School will give that course. They will each take two weeks on giving the students just a brief survey of their particular field. It runs from accounting to cost keeping, transportation. industrial relations and government, so that at the end of the year the student will be in a position to know the subject and to know the men.

Dean Walker: At Kansas we have a certain number of optional hours. I urge students to take certain courses in sociology simply because there is a man teaching that subject whom I want the students to know. I feel that it is of great value to them.

Dean Marston: Our best men prefer administrative duties which prevent contact with students. I have seen this outside of engineering colleges and regret that students are deprived of contact with the best men on that faculty.

President Richards: In the relationship between technical schools and industry I hope that industry and technical schools will work more closely together. I have a degree of pessimism. Industry is hard boiled. It is ready to take what the technical school has to give out but gives little in return. Industry has been concerned chiefly in taking products of the school while they are young and then casting them aside when they may demand a large return for their

efforts. I doubt if this is always true. A letter from one of our graduates protested against report No. 25 of the National Industrial Conference Board. It seems to me that there was a feeling that if there were more and more students in technical schools one should experience a surplus of engineers at the present time and he could not believe that the conclusions in that report were sound. I did not argue with him is I think he did not read the report correctly.

Dean Mitchell: There has been a change in industrial organizations. One who employed highgrade chemists and engineers for a long time was in control of local hands. The family in control died and control passed to a banker group in New York. Is it right for industry to recognize only some obligations to high grade men?

M. W. Alexander: I think there is very distinct spirit and support on the part of industry to recognize the value of engineering schools to itself as well as to the social life of the country and that expresses itself in coöperative efforts such as Dean Bishop referred to. It is not done on a large scale because of the exacting life of executives in industry of which you have no idea unless you have been in such a position yourself. Perhaps engineering teachers themselves have not taken the necessary steps in that direction.

There is a suggestion for bringing about closer relationship, facilities for eliminating some of the difficulties you gentlemen experience with teachers. The suggestion is this. Might it not be practical and feasible to make arrangements between engineering schools and industries whereby the industrial establishment will take one or more of its leading engineering assistants each year and engineering schools will take one or more of its teaching staff of at least the rank of assistant professor of engineering and exchange them for a year, one to work in college under its discipline and the other in the industry. Either institution shall continue to pay the salary of its own man so that the question of compensation may not be raised. There should be an agreement that nei-

ther institution must make any advance to the man nor to retain them even though he desires to do so. I think this would bring closer together the two institutions and perhaps give you some men that have practical experience in engineering capacity and give to the industries a fresh mind of the scientifically trained men of the college.

Dean Cooley: That has taken place here. Fifteen years ago I went to the Allis-Chalmers Company with a plan but we got no further than that.

Dean Marston: I am not anxious that industry should refrain from offering to teachers what they are worth. If we cannot offer enough to make it attractive to them to stay, let them go.

Visitor: Heretofore in teaching engineering we have dealt with materials. The time has come when a great many of our engineering graduates are as much concerned with men as with material. I wonder if the time is not coming when the subject of applied psychology should not be introduced to engineering courses.

Dean Nash: We have endeavored to answer the questions in our curriculum. We do require psychology from all students. Dean Whitehead pointed out a problem this morning and that is training of men for research. At the beginning of the sophomore year we gave a course in scientific methods, applied to any subject or problem. You ask immediately what is contained in that course? I think a little attention early in the course of the college student definitely pointing his mind to scientific methods of approach will make his course more useful to him. With these men you do not have much time for technical work. What should we leave out? It is what we put in that is of more value than what we leave out.

The discussion was closed by the comments of President Hollis, Deans Potter, Holden and Bishop, and Professor Sadler, in relation to the subject of psychology in their respective schools.

Further Discussion of Curriculum.

O. J. Ferguson: It seems to me that in the discussion that I have heard pertaining to length of curriculum that without serious difference of opinion we could group our ideas under three headings. Whether or not the curriculum should contain 4 years. Whether it might be of 5 years combined with the exit at the end of 4 years by way of a degree and later a degree at the end of the fifth year. It might be a straight 5-year curriculum. I should like to ask or propose at this time that we take a rising vote or otherwise show the present preference that might indicate what we have in our minds. I make a motion that a vote be taken. This motion withdrawn as members refused to vote.

It was agreed that this Division at Boulder should take up the question of English. This was to be done by a joint conference with the Committee on English (12) and the Instructors of that subject.

The question of faculty promotion, and similar details, was referred to the Division to be discussed at a meeting but no time was set.

Banquet.

On Saturday evening, January 26, 1924, the sessions were brought to a close by a banquet given by the Board of Regents and President of the University of Michigan to the Conference. At the close of the banquet we were addressed by President Marion Leroy Burton, President of the University of Michigan, who spoke on "American Education." In this address President Burton made clear the differences between the older form of education and the education of to-day, in which individual differences are so marked that it is necessary for us to recognize them in our work. President Burton plead for a return to the more sterling character of the student of four generations ago and showed the necessity of our work to give to the student "stability of intellect, a certain something of intelligent processes, which is nothing but honesty and integrity."

SELLING ENGLISH AT IOWA STATE COLLEGE.

THE "AMES NARRATIVES" AND THE "ENGLISH BOOTH."

BY A. STARBUCK,

Iowa State College.

Note.—This is the second of two articles written at the request of the Committee on English, which hopes that the enthusiasm of the group of teachers giving instruction in English to engineering students at Ames may prove contagious, and the really helpful suggestions contained in Professor Starbuck's articles may be found useful to a large number concerned with this problem of securing better student English.

The factors in the campaign for better English at Iowa State College which were discussed in the last issue of the JOURNAL OF ENGINEERING EDUCATION differ in two important respects from those treated in this paper. The engineering Committee on Journalism and Languages and the all-college Committee on Students' English have been from the beginning coöperative enterprises. So important, indeed, has been the support of the faculty in general for the movement sponsored by these two committees that it may almost be said that the department of English has served in it as scarcely more than a technical adviser, very much interested, to be sure, but under no necessity of attempting any leadership except such as the logic of the situation demanded, content not to stand in the way of progress. The machinery developed by these two committees is intended to be fundamentally helpful through coöperation with students found to be weak in English. But without any question it involves, also, whenever necessary, an insistence on improved English. The general catalogue for 1924–25 has a paragraph on "Students' English," including the statement that "A growing recognition of the importance of English and of the need for a higher standard of expression by students throughout the College has

resulted in the adoption of the policy of granting diplomas only to those students whose written and spoken use of the language measures up to a fair standard of clearness and accuracy."

Thus thoroughgoing faculty coöperation and polite faculty insistence characterize the English "selling" machinery previously discussed. But these two factors are not involved either in *Ames Narratives* or in the English booth, since there was no occasion for insistence in either case and since the latter was departmental in its scope and the former has been so far confined largely to the agricultural subsection of the department. Because this is true, it has seemed best to treat *Ames Narratives* in the words of Professor J. M. Thurber, chairman of the agricultural group of English teachers, under whose direction the volume was published. Professor Thurber says:

"In response to your request for information regarding the use of *Ames Narratives* as a motivating force in the English courses at Iowa State College, I am pleased to give a general statement concerning the need that prompted the idea, the conception and development of the plans for publication, and the apparent results of its use in the narrative sections. My consent to do this is based upon no illusion that this little book represents something epoch-making or heretofore untried, but rather upon the fact that our recent experience may lend assurance to others who are contemplating a similar publication.

"It is no difficult task to demonstrate to students the value of correct sentence structure and the desirability of good paragraph organization, but there is a tendency on the part of students who have become fairly proficient in exposition to wonder what benefit they may derive from a course in narrative writing. If the material for his stories were the meanderings of a salamander in Greenwich Village, the latest fashions among the South Sea Islanders, or some equally inane subjects designed to produce light mental gymnastics,

there might be some justification for this doubt. But when the student discovers that narrative writing offers one of the most direct opportunities in applied psychology; that story writing calls into action every phase of cause and effect relationship; that character portrayal is a supreme challenge to his knowledge of human nature; that the development of settings requires an observance of details that he has never before noticed; and that plot-making is not reserved for a galaxy of gods on Olympus, he is likely to become more enthusiastic over his narrative course than he has been over anything which has preceded it.

"He has been trained to believe that ivy climbing over a wall is beautiful, that green grass, leafy trees, and golden sunsets are beautiful, but that everything else is drab and commonplace. He has never been shown that there is as much beauty and romance within a powerful locomotive whirling its great train across a continent. He does not realize that the emotions of the rural resident are quite as genuine as those of his urban neighbor; he is unaware that ambition is as prevalent, that griefs are as hard to bear, that fears are as terrifying, and love is as enduring with country youths as with their more sophisticated city cousins. In fact, as we are well aware, he supposes that this is quite untrue, and it is the privilege of the true teacher to release these latent powers that the student may see the world as it exists.

"But the search for material which reveals life in these attitudes is peculiarly disappointing. Students enjoy O. Henry, but his settings, characters, and plots deal with phases of life the students know but little; they realize that Kipling is the great modern master, but India and British troops are far removed from their interests; they recognize the artistry of Balzac and de Maupassant, but care little for the manners and customs of Europe. Although this is the recognition of a narrow interest, the natural means of growth is building on to that which already exists.

"When in the preparation of the *Ames Narratives* it was

made clear to them that they were to write stories from the material with which they were familiar, their interest in narrative writing was instantly enlisted. The output of stories was immediately increased and the quality of the product noticeably improved. Some stories of surprising merit were submitted.

"When finally the matter of printing some of the best stories was submitted to the English sections, they were most enthusiastic. As an assurance of their interest they insisted on making a deposit of one half the cost of the book as a nucleus for the publication fund. The publication thus became practically inevitable.

"As soon as I could determine what themes I would use in the little volume, I called together the men who had written these stories and outlined the plan of an organization for the men which soon developed into the local chapter of Kappa Lambda Alpha. I agreed to guarantee the expense of the publication, if the men of the chapter would sponsor the sales of the book. The response of the students in their conduct of the sales was most gratifying. They disposed of a large number of the books on the campus without resorting to undignified practises. In it they enjoyed all the enthusiasm characteristic of a student organization.

"In addition to the books disposed of in this sale, several hundred copies were used in the English sections, to illustrate what should and what should not be found in narrative writing. The effect was far better than any one had anticipated. Because of the fact that the stories had their settings within their own communities, that the characters were to a greater or less extent familiar to them, and that they knew the men who had written the stories, the students found great interest in reading and discussing the stories. Contrary to my expectations they enjoyed the stories within *Ames Narratives* far more than they did the stories of professional writers, and they maintained that the study of this collection was their greatest help in the development of their own stories. In-

cidentally the instructor also found these stories immensely stimulating.

"Shortly after the publication of *Ames Narratives* Kappa Lambda Alpha petitioned Sigma Upsilon, national collegiate literary fraternity, for a charter in that body, and they were successful in their efforts at Commencement time, 1924. One of the men who has since been initiated into the chapter has stated the case most fitly when he said 'Formerly a student wrote with the single motive of making a grade; now he writes with the added hope of gaining membership in Sigma Upsilon.'

"In regard to the quality of the stories in *Ames Narratives*, no one would claim near-perfection for them, and no one can be more conscious of their shortcomings than those whose interests have been claimed by them for the past few months. They must be judged as student work, for they were written by young men who were completing their third quarter of required English work at a technical college. As such, however, they have received a gratifying endorsement of educators from a much wider field than had ever been anticipated. While the publication of such a collection should never be contemplated as a financial enterprise, the best testimony which can be given by those who are responsible for the undertaking is that there have been already submitted about two hundred nicely typed and carefully prepared stories from which will be selected the next group of stories which will be printed in a second edition before the close of the college year."

In just what way *Ames Narratives* will develop remains as yet undetermined. As Professor Thurber has said, the volume was used by classes in English. Although the stories in this first volume were written by agricultural students, they were used during the spring of 1924 by many engineering students; it is probable that *Ames Narratives* in a modified form will hereafter be published jointly by the agricultural and the engineering groups.

The *Ames Narratives* and the work of the Committee on Students' English discussed in the previous paper were wholly serious efforts to sell the idea of more effective English to the students. And there was a serious element in the English booth exhibited during the all-college festival in the spring of 1924. In this booth there were displayed several sets of student papers intended to show improvement made in student work as a result of the English courses. A paper written early in some course was exhibited along side one written later in the same course by the same student, the two papers showing a definite and clearly recognizable improvement in some respect.

The chief inspiration for the booth was, however, the principle that the best way to dispose of an error is to laugh it out of court. With this thought in mind there was put on display, under appropriate headings, a collection of humorous student errors. "Father's Conversion" was the label of this gem: "How father made soap was always a mystery to me. He would place lye, water, and cracklings saved from butchering time into a kettle and to my great astonishment came out a few hours later in the form of soap." This one was called "Practice House Wisdom," in allusion to the fact that the home economics division had recently secured two small children for whose care the girls studying household management were responsible: "Care of milk bottles is important as babies are very sensitive. They should be boiled and dried in the sun three times a day." Those who inspected the booth learned that "I began my college work at the beginning of the epidemic year," that "A virgin forest is where the hand of man has never set foot," that "Vigorously shaking his head, a loud snort rumbled forth," that "Mr. Roosevelt was shot in the middle of his campaign," that "Being a high hill, I sat down," and that "The night was clear. The air was balmy and the moon shone bright. By the gate stood a mule, calm and decomposed."

Some of these little masterpieces were printed in large

letters on cards about two by three feet and posted conspicuously, and some were typewritten on ordinary paper and fastened with thumbtacks on the flat surface of the booth. One placard contained a drawing of a large bottle which was labeled "English Tonic Compound" and guaranteed to be "good as a corrective of ignorance, carelessness, indifference," and to promote "clearness, correctness, interest." Another placard pictured the road of "College Life," which divided into "Good English Highway" and "Lazy Lane." "Good English Highway" was marked by such signs as "Carefulness," "Clear thinking," "Clear expression," and "Lazy Lane" by such as "Carelessness," "Cloudy thinking," "Confused expression." This placard also contained a few quotations, such as Carlyle's "Habit is the deepest law of human nature."

The booth had a constant crowd before it up to the time when it was dismantled at the close of the celebration. It furnished much amusement; and it directed attention, in a spectacular way to be sure, yet in a fairly certain way, to a number of typical language errors. It is entitled to a minor place, along with the engineering Committee on Journalism and Languages, the all-college Committee on Students' English, and *Ames Narratives,* in the campaign for better English at Iowa State College.

NEW MEMBERS.

G. C. SHAAD,

Chairman.

District No. 1.

HALL WESLEY B., Assistant Professor of Electrical Engineering, Yale University, New Haven, Conn.

MESERVE, WILBUR E., Instructor in Electrical Engineering, University of Maine, Orono, Me.

SCHLAGENHAUF, MILTON J., Head of Administrative Engineering Department, Northeastern University, School of Engineering, Boston, 17, Mass.

District No. 2.

WETHERILL, WILLIAM C., Assistant Professor, University of Pennsylvania, Philadelphia, Pa.

District No. 3.

FRAME, FLOYD H., Associate Professor of Electrical Engineering, Missouri School of Mines and Metallurgy, Rolla, Mo.

ORTEN, MAURICE D., Acting Head, Department of Economics, Missouri School of Mines and Metallurgy, Rolla, Mo.

WHITTEMORE, HERBERT L., Mechanical Engineer, Chief, Section 5, Div. VI, Engineering Mechanics Section, Bureau of Standards Washington, D. C.

District No. 4.

FLODIN, JOHN, Instructor in Machine Design, University of Minnesota, Minneapolis, Minn.

KAMMERMAN, JOHN O., Professor of Electrical Engineering, Head of Department, South Dakota State School of Mines, Rapid City, S. D.

District No. 5.

BESSESEN, BENJ. B., Instructor in Electrical Engineering, Oregon Agricultural College, Corvallis, Ore.

BRANCHES.

The **University of Colorado** branch held their annual "get-acquainted" meeting from 4:00 to 6:00 P.M. on October 16 in the library and laboratories of one of the engineering buildings. All members of the faculty and their families were invited. After a short program of music, the time was spent mostly in visiting, as the chief object of the meeting was to help the old and new members to meet one another.

On November 13 the University of Colorado branch held their fall discussion meeting, preceded by an oyster supper. The subject considered was that of the investigation being conducted by the S. P. E. E., particularly the part in which this College of Engineering is participating.

The meeting was opened by Professor M. S. Coover, and turned over by him to Professor J. A. Hunter, chairman of the local investigating committee.

Professor Hunter explained the nature of the whole investigation and gave a synopsis of the topics being investigated by the local committee; namely, "A Study of the Admission and Elimination of Students of Engineering," and "A Study of Engineering Graduates and Former Students."

An open discussion was then had of the following question: "Are entering students better prepared now than they were ten years ago?" Those participating were Dean Evans, and Professors Huntington, Simmering, DuVall, Hutchinson, Marcellus, Germann, Allen, Pietenpol, Mallory, Dungan, and Birk. The general opinion was that students are better prepared now; although it was pointed out by many that a fair estimate could not easily be made, because many faculty members taught in other sections of the country during the first part of the ten-year period, and because the high schools were handicapped during the war period. Some interesting comments were that the training is good in the subjects given,

but that too many subjects are taught; that a general tendency upward is indicated by the longer list of accredited high schools; and that the higher level of intelligence in every community is bound to produce better college entrants.

The program of each meeting was in charge of a committee composed of Professors M. S. Coover, F. S. Bauer, and C. L. Eckel.

W. Otto Birk,
Secretary.

490-0.1K

COLLEGE NOTES.

University of Arizona.—The following are additions to the Faculty of the College of Mines and Engineering: F. W. Garran, Assistant Professor of Civil Engineering; Wm. M. Kellogg, Instructor in Electrical Engineering; M. L. Thornburg, Assistant Professor of Mechanical Engineering; M. J. Leahy, Instructor in Mechanical Engineering; T. S. Lovering, Instructor in Geology; C. J. Cunningham, Professor of Metallurgy and Ore Dressing.

The Board of Trustees of the **Colorado School of Mines,** at its regular monthly meeting on Thursday, January 8, adopted a resolution declaring the presidency of the School vacant from and after September 1, 1925, the date on which the term of Dr. Victor C. Alderson, the present president, expires. With the exception of four years from 1913 to 1917, Dr. Alderson has been president of the School since 1903.

At the meeting of the board Dr. Alderson expressed his intention to continue to coöperate with the board and to carry on his work to the end of his term with the undivided loyalty and enthusiasm that he has heretofore shown, and the board pledged to Dr. Alderson the same unqualified support and cooperation it has heretofore given him.

No action looking to a successor to Dr. Alderson has as yet been taken by the board.

Lafayette College.—A professional degree in any of the various engineering fields will be granted at Lafayette College in the future for one year of graduate study in the department in which the student holds a bachelor's degree and the presentation of a thesis acceptable to the head of the particular department concerned. Degrees included under this new ruling are those of civil engineering, electrical engineering, chemical engineering, mechanical engineering, mining engi-

neering, and administrative engineering. The new plan will be an alternative which may be taken in place of the old plan of conferring the degree on the completion of three years of practical experience after receipt of a bachelor's degree and presentation of an acceptable thesis.

McGraw-Hill Book Company, Inc.—Mr. George W. Farnham who has for a number of years called on college professors for the McGraw-Hill Book Company, New York, has been made Manager of the Educational Department of that company.

Mr. Franklin B. Hanley, recently Instructor in Geology, Washington University, St. Louis, has joined the staff of the McGraw-Hill Book Company as traveling college representative.

n will
l plan
ars of
e and

Farn-
rofes-
s been
com-

ology,
of the
senta-